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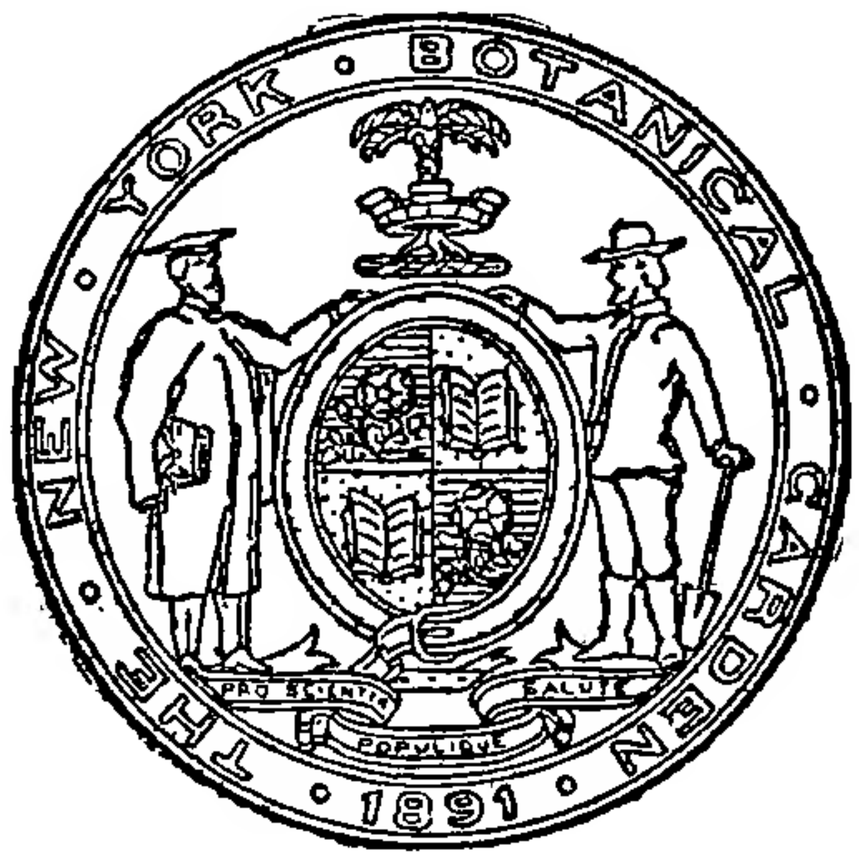
The New York Botanical Garden

Volume VIII, 1912–1917

BULLETIN

OF

The New York Botanical Garden



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1912–1917

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TABLE OF CONTENTS

NO. 27. MARCH 14, 1912

PAGE

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1911 1
Report of the Assistant Director 18
Report of the Head Gardener 24
Report of the Head Curator of Museums and Herbarium 31
Report of the Honorary Curator of the Economic Collections. 37
Report of the Director of the Laboratories. . . 38
Report of the Librarian 45
Report of the Superintendent of Buildings and Grounds 46
SCHEDULE OF EXPENDITURES DURING THE YEAR 1911. . 50
REPORT OF THE CHAIRMAN OF THE SCIENTIFIC DIRECTORS. 65
REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS FOR THE YEAR 1911 68
REPORT OF THE TREASURER FOR THE YEAR 1911 . . 82
REPORT OF THE SPECIAL AUDITOR 86

NO. 28. NOVEMBER 23, 1912

New Species from Bolivia, collected by R. S. Williams—II, by H. H. RUSBY. [*Issued separately, in advance, 19 N, 1912.*] 89
The Polyporaceae of Mexico, by W. A. MURRILL. [*Issued separately, in advance, 20 N, 1912.*] . . . 137
Additions to the Paleobotany of the Cretaceous Formation on Long Island. No. III, by ARTHUR HOLLICK. [*Issued separately, in advance, 20 N, 1912.*] . . 154

NO. 29. MARCH 18, 1913

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1912 171
Report of the Assistant Director 185
Report of the Head Gardener 192
Report of the Head Curator of the Museums and Herbarium. 197

Report of the Honorary Curator of the Economic Collections. 204
Report of the Director of the Laboratories. . . . 206
Report of the Librarian 212
Report of the Superintendent of Buildings and Grounds 214
SCHEDULE OF EXPENDITURES DURING THE YEAR 1912. . 218
REPORT OF THE CHAIRMAN OF THE SCIENTIFIC DIRECTORS. 228
REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS FOR THE YEAR 1912 232
REPORT OF THE TREASURER FOR THE YEAR 1912 . 246
REPORT OF THE SPECIAL AUDITOR 250

NO. 30. APRIL 4, 1914

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1913 253
Report of the Assistant Director . . . 264
Report of the Head Gardener 269
Report of the Head Curator of the Museums and Herbarium. 276
Report of the Honorary Curator of the Economic Collections. 283
Report of the Director of the Laboratories. . . 284
Report of the Bibliographer . . 290
Report of the Librarian 292
Report of the Superintendent of Buildings and Grounds 294
SCHEDULE OF EXPENDITURES DURING THE YEAR 1913. . 298
REPORT OF THE CHAIRMAN OF THE SCIENTIFIC DIRECTORS. 302
REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS FOR THE YEAR 1913 . . 309
REPORT OF THE TREASURER FOR THE YEAR 1913. . 324
REPORT OF THE SPECIAL AUDITOR 329

NO. 31. JULY 10, 1917

Philippine Mosses, by ROBERT S. WILLIAMS. [*Issued separately, in advance, July 23, 1914.*] . . . 331
The Vegetation of Vieques, by PERCY WILSON. [*Issued separately, in advance, June 9, 1917.*] . . 379
GENERAL INDEX 411
GENERIC INDEX 420

VOL. 8 NO. 27

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN

[ISSUED MARCH 14, 1912]

CONTENTS:

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1911 1

Report of the Assistant Director 18

Report of the Head Gardener . . . 24

Report of the Head Curator of Museums and Herbarium 31

Report of the Honorary Curator of the Economic Collections 37

Report of the Director of the Laboratories . . 38

Report of the Librarian 45

Report of the Superintendent of Buildings and Grounds . 46

SCHEDULE OF EXPENDITURES DURING THE YEAR 1911 . . 50

REPORT OF THE CHAIRMAN OF THE SCIENTIFIC DIRECTORS . 65

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS FOR THE YEAR 1911 . . . 68

REPORT OF THE TREASURER FOR THE YEAR 1911 . 82

REPORT OF THE SPECIAL AUDITOR 86

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Vol. 8 No. 27

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1911

(Accepted and ordered printed, January 8, 1912)

To the Board of Managers of the New York Botanical Garden.

Gentlemen: I have the honor to submit herewith my report as Secretary and Director-in-Chief for the year ending January 8, 1912.

The development of the Garden has progressed rapidly during the year just closed by means of city appropriations for construction work and for the improvement of the grounds aggregating $49,800, and of unexpended balances of previous city appropriation. Considerable areas have been improved by grading and drainage and by the construction of additional paths. The two additional greenhouses of conservatory range no. 2 under construction at the time of my last annual report were completed and opened to the public in July, and an additional house for this range will now be provided through a Park Department contract just awarded to Kelly & Kelley for the sum of $10,500. The boundary fence on the western side of the grounds, built by the New York Central & Hudson River Railroad Company under agreement with the City and with the Garden, was satisfactorily completed in the spring; a Park Department contract soon to be awarded will provide a fence along the greater part of the eastern boundary of the Garden, along the newly opened Bronx Boulevard. The collections of living plants, of museum

and herbarium specimens and of books have all been materially increased. New plantations have been established in various parts of the grounds and the older plantations have been modified and elaborated. Direct educational work with the public and with children from the public schools has been continued by lectures, demonstrations, and by docentry. Investigation work over a wide range of subjects has been carried out by advanced students, by visiting officers of other institutions and by members of the staff, and the publications have been continued. Gifts of plants, books and specimens have been numerous, and large accessions to the collections have been made by exchange of duplicate material with other gardens and museums.

Grading and Drainage

During the year, the areas bordering the new arboretum driveway from near the Bleecker Street entrance southward to the southeastern entrance were completely graded, regulated and drained, and the land affected made ready for sowing and planting in the spring. Considerable grading work was done about the completed part of conservatory range no. 2 and around its boiler house. The regulating and grading of the banks along the east side of the river road were essentially completed. The land along the base of the retaining wall of the Bronx Boulevard in the northeastern part of the grounds was completed. Work was continued in filling and draining low areas in the north meadows, where considerable work still remains to be accomplished. At the approach to the Woodlawn Road entrance, advantage was taken of opportunities to obtain several thousand cubic yards of earth filling required there, without cost, by permitting contractors to dump surplus earth from construction operations in the building of edifices outside of the Garden. The removal of the last of the several knolls near the museum building was continued and the rock utilized for the foundations of paths in various parts of the grounds.

A polluted brook which flowed into the Garden through a culvert on the railroad near the west end of the Upper Bridge and which had long been a nuisance was turned into a city sewer by permission of the City Department of Public Works, and this work removes the last menace of this character.

Roads and Paths

The new arboretum road which was essentially ready for final surfacing at the time of my last annual report remains unfinished, owing to unavoidable delay in obtaining the necessary trap rock screenings, but this material will be furnished early in the spring through a Park Department contract awarded late in the autumn. The service road from the stable to the propagating houses was completed and put into use. Work at the new southeastern entrance was continued both by the Park Department and by the Garden.

Work in path construction was carried out on a large scale mainly through the arboretum in the part of the Garden east of the Bronx River, where some 1,200 running feet were finally surfaced and opened to the public, and the Telford foundation of about 6,000 feet more was laid; many of these new paths would have been surfaced and completed but for the delay in obtaining trap rock screenings; they may all be essentially completed in the spring. The foundation for a path along the east side of the Bronx River northward from the Long Bridge, a stretch of some 600 feet, was completed; this work required the building of a river wall, averaging 5 feet in height, for about 500 feet, for which boulders and stones exposed in grading operations and found in old stone walls were utilized, having been saved for several years for this purpose, after the building of the Boulder Bridge had used up a great number of them. These two features and the boulder parapet wall along the river road have used up nearly all the loose large stone on the grounds, a great many having also been broken up and

put into the foundations of paths. Path construction has also been continued in the north meadows along the east side of the river and is going forward there during this winter. Another year's work should make the path system as now planned at least four-fifths complete.

The necessity for railings along paths in various parts of the grounds, which became manifest a few years ago, has been emphasized by the increased number of visitors, and several thousand running feet of such guard rail have been put in place, work which is still in progress at the present time. It seems certain that much more of this rail will ultimately be needed to properly protect many of the plantations, natural thickets and woodlands.

Under the requirements of the Garden's charter, the maintenance of roads and walks rests with the Park Department, but the available appropriations of the Department have not been sufficient to afford a proper scope of maintenance; the driveway surfaces have become badly worn by the increasing number of motor cars and other vehicles. Paths have required little attention except for weeding and regulating of grass edges, which has been accomplished by laborers in the employ of the Garden. Some of the older paths have become worn and need a new coat of trap rock screenings.

Bridges

The four stone bridges are in good order and have required no repairs. The concrete bridge spanning the Bronx gorge below the water-fall, built by the Park Department last year, has proved very useful. The old wooden bridge near this point still remains in position, but it is now quite out of place and it is proposed to demolish it; its removal will afford a splendid view of the water-fall from the new bridge and will make possible the completion of fenced trails through woodlands in this vicinity.

Our general plan calls for one more permanent bridge across the Bronx River, to be located near the southern

end of the north meadows, and a sketch by Mr. John R. Brinley, Landscape Engineer of the Garden, is herewith submitted for consideration.

Water Supply

The six-inch distributing main, encircling the Garden along the main driveways, was entirely completed during the year by the laying of some 800 feet along the new arboretum road. Only lateral one-inch and two-inch distributing pipes in a few areas are now required to make the water supply system complete.

Buildings

Repairs on the older buildings have required more expenditures than in any previous year, as was foreseen at the time of my last annual report. The entire interior of the large glass dome of conservatory range no. 1 (house no. 1 of this range) was doubly painted; this was an expensive task, because it required the construction of an interior scaffold reaching nearly to the top of the house, for which lumber had to be purchased. Four painters in addition to our two regular employees were hired for a period of five weeks. The work was successfully accomplished without accident and with no damage to the collection of palms. Every pane of glass was examined during the painting process and made secure where necessary, but our men report that there was astonishingly little to do in this connection, which speaks very well for the original construction of this large glass dome. The interior of houses 5, 6, 7 and 8 of this range were also painted, advantage being taken of the opportunity to remove the contents of houses 7 and 8 to one of the new houses at conservatory range no 2. It was found necessary to entirely replace the steam heating pipes in the aquatic house (house no. 9 of range 1), and minor replacements of heating pipes in several of the other houses were also necessary.

In the autumn, leaks in the steam main from power house no. 1 to the museum building developed when steam was turned on and it was found necessary to replace portions of this pipe with new lengths and to tighten up the joints of others; this required considerable earth excavation, as the trench in which these pipes rest along this line is too small to permit work to be done within it. Steam leaks also developed at several points within the museum building and were repaired.

Leaks in the roof of the museum building, which have been a more or less continuous source of annoyance, were repaired, and portions of the walls of this building and of the retaining walls of its front approach were pointed. It will be necessary soon to go over a large portion of the cornices of the museum building and other parts of its walls.

Part of the wooden floor of the stable showed weakness during the spring and was found to be partly decayed; it was replaced by a concrete floor. It will be well to treat other parts of this flooring in the same way when the necessity arises.

The minor buildings have required little attention and are in good condition, and the same is true of the whole of conservatory range no. 2.

The necessity of a shop for mechanics mentioned in my last annual report is becoming more and more apparent, and application for an appropriation for such a structure has been included in the estimates of construction requirements during the next five years, requested by the Finance Department of the city.

A hexagonal concrete pergola at the herbaceous grounds may be built during the coming year, plans for it having been approved by the Municipal Art Commission and an appropriation of $2,500 voted for it by the Board of Estimate and Apportionment.

Plants and Planting

Much progress has been made with out-of-door planting during the spring and autumn in the arboretum, in the fruticetum, in the herbaceous grounds valley, in the flower garden, in the boundary borders and along the driveways. A feature of the herbaceous planting in the autumn was the setting of over twenty thousand bulbs of a large number of species in the flower gardens and boundary borders. These should afford a very attractive flower display in the early spring. The greenhouse collections have also been materially and satisfactorily increased, the most noteworthy accession being the large representative collection of cactuses and other desert plants obtained by Dr. J. N. Rose, who accompanied the scientific expedition of the United States Fish Commission steamer "Albatross" to Lower California, organized by the American Museum of Natural History. Many West Indian species not heretofore represented in our collections have been obtained by the several trips of exploration made to that region during the year.

The display labeling of plants both under glass and out-of-doors has proceeded uninterruptedly, several thousand additional labels having been painted. A source of annoyance in this connection has been the repeated thefts of lead labels from shrubs and trees, which has gone so far as to discourage the use of lead for this purpose, which is regrettable, because it makes by far the most attractive and permanent label. An anonymous gift of $100 from a kind friend of the Garden enabled us to do more out-door labeling than would otherwise have been possible.

The collection of Japanese cherry trees presented by Mrs. Florence L. Sturgis was planted in the early spring in proximity to the collection of cherry trees in the arboretum. Very fine healthy plants were secured, which immediately flowered profusely and were viewed with great pleasure by many visitors.

Contributions of money for the purchase of plants,

credited to the "Plant Fund," have been received as follows:

Addison Brown	$250
James Speyer	100
W. Bayard Cutting	100
Bernard G. Amend	100
Walter B. Jennings	100
Mrs. F. K. Sturgis	100
Anonymous	100
Edgar L. Marston	50
Mrs. James H. Aldrich	10

Natural Features

There has been no deterioration of the beauty and interest of the natural features of the reservation, except the death of all remaining chestnut trees except two individuals, out of the many hundreds which existed before the advent of the chestnut tree blight some years ago. The removal of the dead trees has required much careful work in avoiding damage to contiguous trees in the woodlands; the last of the dead trunks are being removed this winter. The ravages of this chestnut blight over a large area of the eastern and middle states is distressing and it is a keen disappointment that the resources of modern science have as yet proved entirely inadequate to prevent the spread of this remarkable disease.

Somewhat more frequent patroling of the wild portions of the Garden has been possible, with excellent results, but it is still desirable that this be considerably increased in efficiency by employing more guards.

Museums

No considerable modification has been made in the arrangement of museum objects, but a large number of new specimens, drawings and photographs have been interpolated in the several collections, and much additional labeling has been done. Provision for some sixteen addi-

tional museum cases is made by a city appropriation, which will be installed partly in the economic museum and partly in the systematic museum. The collection of enlarged photographs from original negatives taken during exploration work mostly in the American tropics was installed on the walls of the systematic museum during the summer and is of much educational value, including 214 studies illustrating characteristic trees, plant societies, fruits, flowers and other features. We have about 150 more photographs available to add to this collection which may be framed and installed.

A very interesting series of old Chinese paintings illustrating the tea plant and methods of collecting and packing its leaves has been presented to the Garden by Dr. Reginald H. Sayre, and is herewith exhibited.

Herbarium

Additions to the herbarium include about 60,000 specimens, obtained principally from exploration work and by exchanges of duplicate specimens with other gardens and museums. Considerably more than one-half of the accessions have been mounted and distributed in the collection, so as to be available for the use of students and investigators. More additional herbarium cases, now greatly needed, may be obtained through a city appropriation for cases, but a considerable additional number will be needed in order to properly preserve future accessions to this most important scientific collection.

Contributions of money, credited to the "Museum and Herbarium Fund" and expended for the purchase of museum and herbarium specimens, were received during the year as follows:

William D. Sloane	$250
N. L. Britton	200
Mrs. F. F. Thompson	200
Arthur F. Estabrook	100
Mrs. Morris K. Jesup	100

Samuel Thorne	100
Miss Catherine A. Bliss	100
Edward V. Z. Lane	100
Mrs. E. H. Harriman	100
Geo. S. Bowdoin	100
John E. Parsons	50

Library

The growth of the library has continued mainly by the aid of funds contributed by members and friends of the Garden. An increase of 639 volumes is recorded by the Librarian, the collection now aggregating 23,578 bound volumes.

Additional steel shelving, providing for some 5,000 volumes, is provided for, which will take care of the growth of the collection for several years.

This large and comprehensive collection of botanical and horticultural literature is attracting students and investigators from all parts of the country and it is desired that efforts to further increase it be continued.

Contributions of money, credited to the "Special Book Fund" and expended for the purchase of books, were received during the year as follows:

J. Pierpont Morgan	$500
Jacob H. Schiff	100
C. F. Cox	100
Louis Marshall	50

Laboratories

The facilities for investigation supplied by the laboratories were taken advantage of during the year by 27 special students and investigators, in consultation with various members of the staff, each person pursuing a different line of study. Monthly conferences of students and members of the staff have been held as formerly and a record of the subjects discussed at these conferences has been published in the Garden JOURNAL. Mr. A. B. Stout,

formerly of the University of Wisconsin, was appointed Director of the Laboratories by authority of the Scientific Directors on October 1, 1911, succeeding Mr. Seaver, who had held that position for several years and who was at the same time transferred to a curatorship. Details of laboratory work are presented in Mr. Stout's report, which is hereto appended. There have been no applications during the year by botanists for the privilege of occupying the laboratory at Cinchona, Jamaica, maintained by us in cooperation with the Department of Agriculture of that island, but a party of entomologists from the American Museum of Natural History and another party of entomologists from Harvard University were given the privileges of this station during the year.

Lectures and Teaching

The system of Saturday afternoon public lectures at the museum building has been continued, commencing April 29 and closing October 28, to appreciative audiences, which have averaged somewhat larger than in previous years. The list of titles of these lectures appears in the report of the Assistant Director. The attendance was well maintained quite to the end of the course and it is proposed to extend the system this year into the month of November. Lectures and demonstrations to children from the public schools were given during the spring; no essential change was made in the methods of presentation.

The provision for docentry made during the last half of 1910 has been continued throughout 1911 with excellent results, and is highly appreciated by those who have come within this system of instruction. Observation of this work has convinced me that it is desirable to elaborate it, and it is planned to extend the appropriation recommended for 1912 by assigning parts of this work to three different members of the staff, in addition to their regular duties, so as to have more docents available when occasion demands it. Inasmuch as the

docents have found it desirable to remain with visitors until quite late in the afternoon, but are not usually required before three o'clock, this method seems to be practicable and experiment will show whether it is satisfactory or not.

The present edition of the guide-book is sufficient for immediate purposes.

Floral Exhibitions

The cooperation with the Horticultural Society of New York in providing exhibitions of plants and flowers open to the public on Saturday afternoons and continued during Sundays following has been considerably elaborated, so that such exhibitions have been held monthly from June until October. They have been viewed by many thousands of visitors and have been wholly successful without the expenditure of much money, the appropriation of $400 for prizes made in the budget for 1911 proving sufficient. Much interest in these exhibitions has been shown by enthusiastic friends of horticulture.

Exploration

By means of liberal contributions from members and friends of the Garden, the policy of conducting exploration work in regions botanically little known has been continued with great advantage to the collections, and important contributions to knowledge have been thus secured. Work in western and central Cuba was accomplished by myself during the latter part of February and the month of March, assisted by Mrs. Britton and by Mr. John F. Cowell, Director of the Buffalo Botanic Garden. Dr. J. K. Small, Head Curator, explored portions of the Florida Everglades and of the Florida Keys during February; Mr. Percy Wilson, Assistant Curator, spent parts of December, 1910, and January, 1911, in western Cuba; Dr. J. A. Shafer, Special Agent, explored portions of the difficult mountain region of eastern Cuba

during the early part of the year, and was again commissioned in November for work in the extreme western part of Cuba.

Dr. P. A. Rydberg, Curator, visited southeastern Utah from the latter part of June until the end of August. In the autumn, Dr. J. N. Rose, Curator of Plants in the United States National Museum, was commissioned to accompany the expedition organized by the American Museum of Natural History for the exploration of the Lower Californian peninsula by means of the Fish Commission steamer "Albatross."

This work has been mainly accomplished by contributions to the "Exploration Fund" as follows:

Andrew Carnegie	$1,000
James B. Ford	500
John Innes Kane	500
W. K. Vanderbilt	500
Ogden Mills	500
John D. Archbold	200
Edward S. Harkness	200
Geo. F. Baker	200
Mortimer L. Schiff	200
Geo. W. Perkins	200
Cleveland H. Dodge	100
Francis Lynde Stetson	100
James A. Scrymser	100
Thos. H. Hubbard	100
Wm. J. Matheson	100
Edward D. Adams	100
Louis C. Tiffany	100
Chas. G. Thompson	100
Robt. W. de Forest	100
Miss Elizabeth Billings	100
H. C. von Post	100
H. C. Fahnestock	100
Isaac N. Seligman	100
Myles Tierney	100
Henry W. de Forest	50
A. G. Agnew	50

Adrian Iselin, Jr.	50
James Douglas	50
Edmund Coffin	50
Mrs. Richard March Hoe	25

The surprisingly large number of unknown kinds of plants revealed by this expeditionary work especially in tropical America, abundantly warrants its continuation and expansion. As a striking example of the results already reached, it may be recorded that not fewer than 400 species of plants new to science have already been detected in the island of Cuba alone, and there are large areas of that island difficult of access which still remain unvisited by botanists.

Investigations

The increased size of the collections and the increased and steadily increasing demands on the Garden for information and advice are now taxing the time of the staff to an extent which leaves most of us little opportunity for original investigation, though some is accomplished outside of regular hours of attendance. There is need for two more trained botanists, but present available funds are not sufficient to obtain them.

Visiting officers from universities, colleges and museums have taken advantage of the collections and laboratories of the Garden for research.

During a six weeks' absence from the Garden in the autumn I carried on studies of West Indian plants at the Royal Gardens, Kew, and at the British Museum of Natural History, and there solved a large number of interesting problems. Visits to American institutions have been made by other members of the staff.

Research Scholarships and Aid for Students Research

The following students have been aided by research scholarships and by grants from the income of the students research fund during the year.

Mr. W. W. Eggleston was awarded a scholarship in February to aid him in continuing his work upon the genus *Crataegus*.

Mr. A. LeRoy Andrews held a scholarship in July while monographing the Sphagnaceae for NORTH AMERICAN FLORA.

Professor Bruce Fink held a scholarship in August and September while studying certain genera of lichens and preparing a series of articles on this group for MYCOLOGIA.

Mr. R. C. Benedict held scholarships in August and November, preparing manuscript for NORTH AMERICAN FLORA on the subject of ferns.

Mr. William R. Maxon continued his monographic work on ferns for NORTH AMERICAN FLORA during the month of December with the aid of a scholarship grant.

Preservation of Native Plants

The accumulated income of the fund of $3,000, presented to the Garden several years ago by the Misses Caroline and Olivia Phelps Stokes, now aggregates over $5,000. It is proposed to utilize this money for the illustration in color of certain wild flowers most needing protection from indiscriminate picking and to publish these colored illustrations with appropriate text in the Garden JOURNAL.

Public Exhibits

The Garden was given an alcove in the Budget Exhibit arranged by the Board of Estimate and Apportionment of the city in the autumn, and this was made up of screens on which maps, photographs and tabulated appropriations and expenditures were shown. At the Child Welfare Exhibit, held in February, a similar display was installed, with special reference to the occasion.

Police Protection

The city police patrol of the Garden has been made somewhat more complete during the year by an additional officer, the area being now divided into two posts, the one east of the Bronx River, the other west, and a mounted officer has been supplied for part of the time. We have supplemented this protection by three keepers paid from our own appropriations throughout the year, and have detailed gardeners and laborers for this duty on Saturdays, Sundays and holidays and on late afternoons of other days during the summer. This force has prevented any serious damage or vandalism, though it has been by no means sufficient to prevent various annoyances to visitors and minor depredations. I was interested during my recent visit to the Royal Gardens at Kew, England, to learn that twenty-four constables are there employed, and the area of Garden land at Kew is only a little larger than ours, and it is completely surrounded by a high wall and is closed during the night.

Administration

The details of administration, which become more numerous as the reservation becomes more fully developed and the collections increase, have been largely referred to Dr. W. A. Murrill, Assistant Director, and to Mr. R. S. Williams, Administrative Assistant, both acting under my immediate direction. The new construction work has been under my own immediate supervision, assisted by Mr. Arthur Corbett, Superintendent of Buildings and Grounds, and I have also supervised the installation of new collections, aided by the curators and by the Head Gardener. I have found a limited amount of time available for personal study of the collections and for the continued prosecution of investigations of the American flora and of the cactus family, largely in cooperation with Dr. J. N. Rose, of the United States National Museum.

Financial Considerations

The development of the Garden has been continuous since work was commenced in 1895 and has proceeded so rapidly through the expenditure of liberal construction appropriations by the city and by funds and appropriations by the Board of Managers for the formation and increase of the collections, that available funds for maintenance have not kept pace with their requirement. The budget herewith submitted contemplates an expenditure for 1912 of approximately $100,000, which is considerably less than the amount which could be expended to advantage at the present time. Appropriations aggregating $90,565 are provided by the city, and the remainder needed from funds of the Board of Managers, which leaves us only about $14,000 available from these funds for educational and artistic purposes and for the increase of the collections, it being necessary to reimburse our general income account by some $6,000 borrowed from it in previous years. It is greatly desired that the income of the Garden from private sources should be materially increased.

Reports Appended

Detailed accounts of the work accomplished during the year will be found in the appended reports submitted by the Assistant Director, the Head Gardener, the Head Curator of Museums and Herbarium, the Honorary Curator of the Economic Collections, the Director of the Laboratories, the Librarian, and the Superintendent of Buildings and Grounds, and a schedule of expenditures submitted by the Accountant.

Respectfully submitted,

N. L. Britton,

Director-in-Chief.

REPORT OF THE ASSISTANT DIRECTOR

To the Director-in-Chief.

Sir: I have the honor to submit the following report for the year 1911.

Grounds and Buildings

The lawns and plantations suffered severely during the long droughts of spring and summer, when the water supply became so low that even the drinking fountains had to be turned off, but it is believed that little permanent injury was done. Owing to the dry weather in May, there was no recurrence of leaf-blight on the plane-trees, such as had affected them very seriously for the three previous seasons. Plant diseases and insect pests were successfully controlled by the usual methods. Painting, repairing, and artificial watering figured largely in the current expenditures of the year. The number of visitors continues to increase and their interest in the institution is evidenced in many ways.

Publications

The usual publications have been successfully continued during the year.

Journal

The Journal has been published for each month during the year, making a volume of 290 pages, with 3 plates and 47 figures.

Mycologia

This periodical has appeared on alternate months during the year, making a volume of 303 pages, with 22 plates and 5 figures. Twenty-three species of fungi were illustrated in their natural colors in this volume.

Bulletin

Bulletin no. 25, with 120 pages, was issued March 16, 1911. It contains the annual reports of the Director-in-Chief and other officers for the year 1910.

Bulletin no. 26, completing the seventh volume, contains "A Biologic and Taxonomic Study of the Genus Gymnosporangium," by Frank Dunn Kern, and two indexes, making a total pagination of 494 pages, with 11 plates and 68 figures, for Volume VII.

Contributions

Contributions by members of the staff or students of the Garden reprinted during the year from other than Garden publications, are as follows:

No. 139. "Additions to the Flora of Peninsular Florida," by J. K. Small.

No. 140. "Studies on the Rocky Mountain Flora—XXIV," by Per Axel Rydberg.

No. 141. "Studies on the Rocky Mountain Flora—XXV," by Per Axel Rydberg.

No. 142. "Notes on Rosaceae—V," by Per Axel Rydberg.

No. 143. "Results of a Preliminary Study of the So-called Kenai Flora of Alaska," by Arthur Hollick.

No. 144. "The Paleobotanical Collections of the New York Botanical Garden," by Arthur Hollick.

No. 145. "Notes on Rosaceae—VI," by P. A. Rydberg.

North American Flora

Volume 25, part 3, containing descriptions of the families Rutaceae and Surianaceae by Percy Wilson, the Simaroubaceae by J. K. Small, and the Burseraceae by J. N. Rose, was issued May 6, 1911.

Lectures

Public Lectures

Illustrated public lectures on botanical subjects have been given in the museum building on Saturday afternoons

from April to the last of October, as outlined below. The average attendance during July and August was twenty per cent. less than in May and June, and about forty-seven per cent. less than in September and October.

April 29. "The Preservation of Our Native Plants," by Dr. N. L. Britton.

May 6. "What is Botany?" by Dr. C. Stuart Gager.

May 13. "Transforming an Old Swamp," by Mr. George V. Nash.

May 20. "The Reef-building and Land-forming Seaweeds," by Dr. Marshall A. Howe.

May 27. "The Influence of Soil Acidity on Plant Distribution," by Mr. Frederick V. Coville.

June 3. "How Plants are Distributed," by Professor C. C. Curtis.

June 10. "The Royal Gardens at Kew, England," by Dr. W. A. Murrill.

June 17. "Collecting in the High Mountains of Colorado," by Mr. Fred J. Seaver.

June 24. "Past Climatic Conditions Indicated by Fossil Plants," by Dr. Arthur Hollick.

July 1. "Wild Flowers of Summer," by Dr. N. L. Britton.

July 8. "Swedish Botanical Gardens," by Dr. W. A. Murrill.

July 15. "Plant Diseases and Their Control," by Mr. Fred J. Seaver.

July 22. "The Uses of the Cacti," by Dr. H. H. Rusby.

July 29. "Plants as Insect-traps," by Dr. John H. Barnhart.

Aug. 5. "Botanical Exploration in Haiti," by Mr. George V. Nash.

Aug. 12. "The Paris Botanical Garden," by Dr. W. A. Murrill.

Aug. 19. "A Visit to the Panama Canal Zone," by Dr. Marshall A. Howe.

Aug. 26. "Evergreens: Their Uses in the Landscape," by Mr. George V. Nash.

Sept. 2. "The Berlin Botanical Garden," by Dr. W. A. Murrill.

Sept. 9. "Plants and People of Pinar del Rio, Cuba," by Dr. C. Stuart Gager.

Sept. 16. "The Fruit Industry of the Northwest," by Mr. George V. Nash.

Sept. 23. "The Vegetation of the Dismal Swamp of Virginia," by Dr. Arthur Hollick.

Sept. 30. "The Progress of the Development of the New York Botanical Garden," by Dr. N. L. Britton.

Oct. 7. "Some Scenic and Floral Features of Cuba," by Dr. Marshall A. Howe.

Oct. 14. "The Movements of Plants," by Professor C. C. Curtis.

Oct. 21. "Some Types of Variegated Plants," by Professor R. A. Harper.

Oct. 28. "The Methods of Detecting Adulteration in Foods and Drugs," by Dr. H. H. Rusby.

School Lectures

The usual lectures and demonstrations were given in the spring to the public school children of the 4B and 5B grades, of the Borough of the Bronx, under the auspices of the Board of Education, as follows:

Grade 4B

Lecture I, "Cultivation of Plants," by Mr. George V. Nash, was given to groups of pupils on April 25 and April 27.

Lecture II, "Seedless Plants," by Dr. Marshall A. Howe, on May 9 and May 11.

Grade 5B

Lecture I, "Industries Depending Upon Forests. Plant Products," by Dr. H. H. Rusby, on April 18 and May 23.

Lecture II, "Woody Plants and Plants without Wood. Protection of Trees in Cities," by Mr. F. J. Seaver, on May 2 and May 4.

Lecture III, "Classification of Plants," by Dr. N. L. Britton, on May 16 and May 18.

Scientific Meetings

The monthly Conferences of members of the staff and students have been continued, and a report of each meeting has been published in the current number of the JOURNAL.

The Torrey Botanical Club has met each month as usual in the morphological laboratory of the museum building.

The Horticultural Society of New York, in cooperation with the New York Botanical Garden, held exhibitions of plants and flowers in the museum building on June 10 and 11, July 1 and 2, August 26 and 27, and September 16 and 17. Accounts of these exhibitions were published in the JOURNAL for August and September.

The Municipal Engineers of the City of New York made a visit of inspection to the Garden on the afternoon of Saturday, June 17. At two o'clock, an illustrated lecture on "The Protection of Shade Trees" was given in the lecture hall of the museum building, and the remainder of the afternoon was devoted to the inspection of the buildings and grounds under the guidance of members of the Garden staff.

Personal Investigations

Attention has been directed chiefly to the collections of tropical gill-fungi in the herbarium of the Garden. Four articles on this subject, comprising fifty printed pages and containing descriptions of sixty-one species new to science, have been published during the year in MYCOLOGIA.

A number of colored illustrations of fleshy fungi for a series of articles appearing in MYCOLOGIA have been prepared under my direction, together with careful descriptive notes from the fresh specimens. Twenty-three species have been published in this series during the year.

Owing to the abundance of fleshy fungi during the autumn and the great public demand for information regarding edible and poisonous species, a set of colored

plates has been prepared under my direction for the swinging frames in the museum.

An expedition to the Pacific Coast to make a general collection of the larger fungi was undertaken in late autumn. Stops were made at various points in Washington, Oregon, and California, and very extensive and important collections secured for the Garden herbarium.

Respectfully submitted,

W. A. MURRILL,
Assistant Director.

REPORT OF THE HEAD GARDENER

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1911.

Systematic Plantations

HERBACEOUS GROUNDS. There have been grown in the herbaceous collections, including those at the nurseries, about 2,950 species and varieties. There are 125 beds in this tract, 2 having been added the past year, one for the Basellaceae, the other for the Loasaceae. There have been 392 individual show labels and 3 family signs added.

FRUTICETUM. About 1,700 specimens here represent about 727 species and varieties. There have been 250 show labels added.

SALICETUM. In this collection there are 38 species and varieties, represented by about 110 specimens. 83 show labels have been prepared.

DECIDUOUS ARBORETUM. There are about 280 species and varieties, including those native to the tract. 218 labels have been made.

PINETUM. The collection of conifers contains 274 species and varieties; there are 1,062 specimens. 40 show labels show have been added.

VITICETUM. There are 48 species represented here.

CONSERVATORIES. The collection of tender plants, including those at the propagating houses, represent about 207 families, 1,455 genera, and 8,450 species and varieties. The total number of plants in the conservatories is about 15,373.

RANGE NO. 1. There have been 2,311 show labels added here. The collections comprise about 11,835 plants, distributed in the houses as follows: no. 1, 224; no. 2, 468; no. 3, 560; no. 4, 458; no. 5, 1,449; no. 6, 679; no. 7, 1,007;

no. 8, 608; no. 9, 142; no. 10, 958; no. 11, 408; no. 12, 1,128; no. 13, 665; no. 14, 644; no. 15, 2,350; cellar, 87.

Upon the completion, early in the summer, of the additional houses at range no. 2, the contents of houses nos. 7 and 8 were transferred to one of the new houses there. This permitted a re-arrangement here of the desert collections which were becoming much over-crowded. The orpine family, the South African desert plants, the fleshy spurges, the desert bromeliads, and one genus of cactuses were placed in house no. 5. No. 6 was given to the collection of century plants and other American desert plants, and such large specimens as could not be satisfactorily included in the families allotted to the different houses. Nos. 7 and 8 were allotted to the cactus family, the Cereoideae were placed in no. 7, and the Opuntioideae and Pereskioideae in no. 8.

RANGE NO. 2. There have been 327 show labels added here. There are 3,538 plants, distributed in the houses as follows: west, 76; middle, 131; east, 63; west north and south, 1,112; east north and south, 2,140; runway, 16. The west north and south house, finished early in the past summer, contains the tropical dicotyledonous plants, those formerly in houses nos. 7 and 8 of range no. 1. The enlargement of the east north and south house during the past summer permitted of a much better display of this collection, hitherto much over-crowded, and the incorporation with it of many other ferns formerly at the propagating houses.

PROPAGATING HOUSES AND NURSERIES. A great amount of propagating has been performed here. The experiments being conducted under the direction of the Director-of-the-Laboratories has required the propagation of considerable additional material, and will demand much more in the future; this will tax the present facilities. Parts of houses 2 and 4 have been given over to this experimental work, and more room will be required in the near future. Large numbers of bedding plants have also been propagated

for the decorative collections, and constant propagation of new plants from the older specimens in the systematic collections is required in order to safeguard these. The plants in the propagating houses, including those in the cold frames, number 9,723. There have been received 1,402 packets of seeds, as follows: by gift, 46; by exchange, 1,287; collected on expeditions, 53; by purchase, 16. In addition to these, 961 packets have been collected from the collections to safeguard their integrity.

LABELING, RECORDING, AND HERBARIUM. The details of this work have been attended to by one gardener and one aid. There have been 750 show labels repaired. In addition to this, the following new show labels have been made: arboretum, 218; herbaceous grounds, 383; economic garden, 40; morphologic garden, 20; west border, 181; salicetum, 83; fruticetum, 250; pinetum, 40; along driveways and paths, 152; conservatory decorative beds, 81; beds along path from the elevated approach to range no. 1, 110; conservatories, 2,598; total, 4,156.

Accession numbers 33,156 to 35,001 have been recorded, making a total of 1,846 accessions.

The following plants have been acquired: by gift, 748, valued at about $1,850.00; by exchange, 391; derived from seed, 2,284; collections made by members of the staff and others, 1,896; by purchase, 24,909 (including 22,000 bulbs); total, 30,228.

To the herbarium of cultivated plants 519 specimens have been added.

The following is the approximate number of kinds of plants in each collection: conservatory, 8,450; herbaceous, 2,950; fruticetum, 727; salicetum, 38; deciduous arboretum, 280; pinetum, 274; viticetum, 48; total, 12,767.

Miscellaneous Collections

MORPHOLOGICAL GARDEN. This collection remains about as it was last year. Twenty group signs have been made for it.

Economic Garden. This continues to be one of the most attractive features. Eleven show labels and 29 group signs have been made for it.

Desert Plants. The grouping of these plants, contained during the cold weather in the nearby conservatories, was the same as that of the previous year, the increased size of the collections, due especially to the growth of individual plants, making it necessary to considerably enlarge some of the beds. This same reason will make necessary the coming summer a further enlargement of the space required to accommodate these collections, which constitute one of the most attractive features in the court of conservatory range no. 1.

Conservatory Lily Pools. The display of tender lilies in the westerly pool was exceptionally fine the past season. The Paraguay royal water lily, *Victoria cruziana*, did unusually well, making many flowers and maturing a number of seed pods. Twelve show labels were added.

Aquatic Garden. There was the usual attractive display of water lilies during the early part of the summer, but the shortage of water later considerably interfered with the appearance of this garden. The plantings of shrubs, trees and herbaceous plants which have been made in the border of this pond from time to time are now adding much to the beauty of the collections. Forty show labels have been placed here.

Rhododendron Banks. The groups of rhododendrons, planted the previous spring on the easterly bank of the west lake and on the nearby southerly bank, attracted much attention. Starting late in May, with the delightful pink blossoms of *R. punctatum*, through June with the flowers of *R. catawbiense*, and into July with those of *R. maximum*, there was a continuous profusion of flowers. Groups of the Madonna lily, *Lilium candidum*, planted the fall previous, did exceptionally well, making masses, during June, of the purest white in contrast with the dark green of the surrounding rhododendrons. Many more of these

charming lilies have been planted the past fall. The general appearance of this bank has been greatly improved by extending out into it on the northern end the wild group of sassafras by adding more specimens secured in other parts of the grounds, and by adding plants of the Kentucky coffee-tree and of various species of thorns on the southern end, breaking up the flat appearance of the bank.

Other Decorative Plantations. Under this heading are grouped the flower garden to the north of conservatory range 1, those at the elevated approach and west border, and a new flower garden installed along the path from the elevated approach to conservatory range 1. This planting consists of a bed 10 feet wide on each side of the path; herbaceous plants were planted there this spring, including many annuals. The portions devoted to annuals were planted with bulbs during the fall, and will again receive annuals when the bulbs are done flowering next spring. 372 show labels have been made for these decorative beds, distributed as follows: conservatory, 81; west border, 181; new beds, 110.

General Horticultural Operations

The force for carrying on this work consisted of 2 foreman gardeners, 20 gardeners, 1 apprentice, about 25 laborers, and 4 drivers during the open season. The details of the conservatory work have been under the direction of foreman gardener, Richard Richter; under him were 13 gardeners, 1 apprentice, and 1 laborer. The details of the outside work have been carried out by foreman gardener, John Finley, who has had under him 7 gardeners, 24 laborers, and 4 drivers.

In addition to the routine horticultural operations, the following new planting has been acomplished. During the spring, about 56 lilacs, derived from elsewhere in the grounds, were planted at the base of the retaining wall in the arboretum tract; 3 willows were placed along the main driveway in the salicetum; the woody plants in the

conservatory beds were rearranged, the surplus being used elsewhere on the grounds in decorative planting; the west border, north of the plaza, was entirely rearranged, and broadened in places; along the path from the elevated approach to conservatory range 1 new flower beds were developed; 2 pin oaks were planted along the main driveway in north meadows; a group of cornus was placed on the east shore of the middle lake; 5 white ash trees were planted along the approach to the Woodlawn Road bridge; the shrub planting on the bank in the neighborhood of the north bridge was completed; Japanese ivy was placed at the abutment of the Woodlawn Road bridge; the decorative bed of *Ilex* in the fruticetum was enlarged; the decorative groups opposite the pea family in the fruticetum were enlarged with shrubs of the same family.

The most important piece of planting during the spring was a group of 20 Japanese cherry trees in the little valley in the neighborhood of conservatory range 2. These trees were secured on Long Island, and were from 6 to 12 feet tall. They were transported by our own teams during the last of March, and were safely planted in their new home within 48 hours after removal from the ground at the nursery. They bloomed freely and have made a good growth during the summer.

During the fall, the shrub planting on the south side of the road at the Bedford Park entrance of the Southern Boulevard was rearranged, the material when spread out being sufficient to plant the entire open area between the road and the path; the *Weigela* triangle to the east of conservatory range 1 was rearranged, there being sufficient, when spread out, to cover the triangle; a barberry hedge was planted along the west side of the nursery; a privet hedge was placed around the manure enclosure at the nursery; a large group of thorns was planted in the west border near the end of the west lake; the natural planting along the south shore of the west lake,

in the neighborhood of the shelter station, was extended by adding groups of white birch, alders, and elders; around the shelter house was placed a groups of thorns and swamp rose; in the rhododendron banks the natural growth of sassafras trees was enlarged by adding more, and additional groups of thorns and Kentucky coffee-trees were added for shade for the rhododendrons, and to relieve the flatness of the banks; catalpas were planted along the driveway to the east of the north bridge; the decorative group of cherries in the fruticetum near the lake bridge has been enlarged by about 50 plants; about 22,000 bulbs were planted in various parts of the grounds—in the different flower beds for early flowering effects, in the rhododendron banks, among the shrubbery, and in the stone enclosure around the fountain at the foot of the approach.

Investigations

In addition to my ordinary duties, I have continued my studies upon the grasses for NORTH AMERICAN FLORA, and have submitted for publication manuscript for another part, including the remainder of the tribe Andropogoneae, the tribes Zoysieae and Tristegineae, and a part of the tribe Paniceae.

Respectfully submitted,

GEORGE V. NASH,

Head Gardener.

REPORT OF THE HEAD CURATOR OF MUSEUMS AND HERBARIUM

Dr. N. L. Britton, Director-in-Chief.

Sir: I have the honor to submit the following report for the year 1911.

The collections in my charge were developed and cared for on the plans and by the methods outlined in several of my former reports.

Specimens were received as follows:

By gifts and purchases	4,857
By exchanges	3,243
By exploration	17,972
Total	26,072

A total of 11,061 duplicate specimens were sent to other institutions and to individuals in exchange.

Museums

The general arrangement of the several public museums was not changed. Individual exhibits were rearranged, new ones were installed and miscellaneous specimens added.

The Fossil Plant Museum was improved by the substitution of new or better specimens to replace old ones. These were labeled and many of the old labels in the floor cases were revised and reprinted. The data on the temporary labels in the wall cases were transcribed and copy prepared for permanent labels.

The Economic Museum was increased by the interpolation of many specimens of drug-plants and food-plants, and by miscellaneous specimens throughout the various exhibits. An important addition to the exhibit of flavoring agents was a collection of photographs showing the methods of culture and of curing the vanilla bean. A few large plates to illustrate the source, habit,

and other characters of various crude or refined plant-products were installed, and many more plates of a similar character are ready to be put in the cases as soon as labels are printed.

THE SYSTEMATIC MUSEUM, which formerly embraced three distinct elements, was increased by one more. A PLANT PHOTOGRAPH EXHIBIT was installed. At present, it consists of 214 photographs 11 × 14 inches in size. They are contained in fifty large oak frames, some of which are divided by cross-bars into four compartments, others into six. The photographs illustrate plant-societies, habits, and structure of the flowerless and the flowering plants. The frames containing these groups of photographs occupy the piers between the casing of the large windows, and although the present arrangement is tentative, it has been made, like the other elements of the systematic museum, as far as possible, to bring related plant groups into proximity. About 150 more photographs have been made and furnished with printed labels so that they may be added to this exhibit as soon as more frames are available.

THE SYNOPTIC COLLECTION was increased by the addition of miscellaneous specimens which were obtained chiefly through the system of exploration the Garden is maintaining in tropical America.

THE LOCAL FLORA was increased by a few odd additions, and the fern collection was made complete by the installation of the desiderata.

THE MICROSCOPE EXHIBIT remained the same as in the previous year except for some renovation and the improvement of several of the specimens.

Herbaria

The additions to the herbarium represent plants from nearly all parts of the globe, from the Arctic regions, the north and south temperate regions and from the tropics. The greatest increases were naturally from the geographical

regions where the Garden's work is most active and in the plant-groups in which the members of the scientific staff are engaged in studying and monographing.

Only such specimens as were needed for the current and future work of the Garden were mounted and incorporated in the permanent collections. Consequently about 32,000 herbarium sheets containing approximately 60,000 specimens were added to the various divisions of the herbarium. Several hundred desirable specimens from the Morong Herbarium were mounted and incorporated in the Columbia University herbarium.

Investigations and Assistance

Dr. P. A. Rydberg, Curator, continued the general care of the collections of flowering plants and continued his monographic work on the Rosaceae for the NORTH AMERICAN FLORA. He also carried onward his studies on the flora of the Rocky Mountain Region, publishing a paper in this connection in the *Bulletin of the Torrey Botanical Club*, and prepared a report on the plants secured on two of Peary's North Polar Expeditions. During the summer, Dr. Rydberg prosecuted botanical exploration in southeastern Utah covering territory which had not before been explored. A detailed report of this expedition was published in the November number of the JOURNAL, and the plants collected have been mounted and are now being studied. On his return from the field, Dr. Rydberg visited the herbarium of the Missouri Botanical Garden in order to study their collections of Rosaceae in connection with the monographic work referred to above.

Dr. Marshall A. Howe, Curator, continued in charge of the collections of algae and hepaticae. The herbarium work under his direction has resulted during the year in adding to the collections about 4,600 mounted sheets of hepaticae and 400 sheets of algae. An important feature of this work has been the substantial beginning of the task of incorporating the Mitten and the Underwood collections

of hepaticae with the general hepatic collections of the Garden. In the museum work the most important feature has been the preparation of 214 enlarged photographs of plants and explanatory labels, a detailed account of which was published in the JOURNAL for October. Dr. Howe has acted as an associate editor of the publications of the Torrey Botanical Club, and, in addition to a few reviews in *Torreya*, has published papers on "A Little-known Mangrove of Panama" and "Some Marine Algae of Lower California, Mexico." He has also delivered three lectures in the Garden lecture course.

Dr. Arthur Hollick, Curator, continued in charge of the collections of fossil plants, and together with Mr. Edwin W. Humphreys who volunteered his aid, accomplished the changes and progress referred to on a previous page. Dr. Hollick delivered three public lectures on the regular Garden course, and published a half dozen papers dealing with both living and fossil plants, in various journals. He also acted as editor of the BULLETIN of the Garden. Leave of absence was granted Dr. Hollick up to May 7, and also from October 16 to the end of the year, so that he might assist the United States Geological Survey in studying and reporting on the fossil flora of Alaska.

Mr. Fred J. Seaver, Curator since October 1, has been largely occupied with work outlined in his last report as Director of the Laboratories. He has continued to act as editor of the JOURNAL of the Garden, and, in Dr. Murrill's absence, has also acted as editor of MYCOLOGIA. A limited amount of time has been spent in the collection and study of the more inconspicuous and little-known microscopic fungi occurring in and about New York City. Some time has been spent in the study and naming of miscellaneous material sent in for determination, as well as the lower fungi collected by other members of the staff and himself, and in preparing this material for mounting. Critical studies have been carried on in certain groups of the discomycetous fungi, and in the family Trichosphaeri-

aceae, the latter being prepared for publication in NORTH AMERICAN FLORA. He has also cooperated in minor details with Dr. Charles E. Fairman of Lyndonville, New York, in his monograph of the Lophiostomataceae, this work also being in connection with NORTH AMERICAN FLORA. A limited amount of time has been spent in cooperation with Dr. E. D. Clark in experimental work on the chemistry of the heating of soils and its effect on the growth of plants.

Mr. Percy Wilson, Assistant Curator, completed his monograph of the family Rutaceae, which was published early in the year in a part of volume 25 of NORTH AMERICAN FLORA. Most of his time not occupied with other curatorial work was devoted to the sorting, labeling and study of the large collections of Cuban plants resulting from the systematic exploration of that island. Mr. Wilson also prepared and installed the Garden's portion of the Budget Exhibit of the City of New York. He also published several illustrated papers on American plants and spent the greater part of December in exploration in western Cuba.

Mrs. Britton voluntarily devoted the year to general correspondence for the upbuilding of the moss collection, thus arranging and making exchanges with European institutions and individual bryologists, especially in order to secure specimens of species not represented in our collection, primarily in the various genera now being studied and monographed for NORTH AMERICAN FLORA. She also spent some time at the Royal Gardens, Kew, England, and at the British Museum, studying their moss collection in connection with her work on NORTH AMERICAN FLORA and in getting the geographical ranges and determinations of doubtful or unknown species of mosses, particularly from the West Indies.

The writer when not occupied with the curatorial routine and detail, devoted his time to monographic work in connection with NORTH AMERICAN FLORA, having finished and

printed the family Simaroubaceae in a part of volume 25 of that work early in the year. About five weeks of the winter were spent in exploration in tropical Florida, both on the Everglade Keys and in the lower Florida Keys. The collections made in these regions are now being studied and a report on the field work was printed in the JOURNAL for July and another paper concerning discoveries of an earlier expedition was published earlier in the year.

Respectfully submitted,

JOHN K. SMALL,

Head Curator of Museums and Herbarium.

REPORT OF THE HONORARY CURATOR OF THE ECONOMIC COLLECTIONS

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1911.

The increase in our collections during the year has been small, including only fifty-five specimens, attention having been chiefly directed toward the determination of un-named specimens already in the Museum. The most noteworthy additions are twenty-eight specimens of rare drugs, a set of specimens representing the Guayule rubber industry and a set of photographs representing the vanilla industry.

Considerable progress has been made during the year in the classification and determination of our large collection of varnish resins, for which the label manuscript will soon be completed.

My own work during the year has centered largely upon the determination of a collection of Bolivian plants sent by the Commissioner of Agriculture of that Republic. Very many of these specimens represent timber woods and other economic products and it is hoped that, at a later period, we may add such specimens to our Museum collections.

During the latter part of the year, arrangements were completed for securing a contribution of a complete exhibit of perfumery materials.

I am looking forward with interest to the rearrangement of some of our cases, which are now overcrowded, when the new cases now provided for shall be installed.

Respectfully submitted,

H. H. RUSBY,

Honorary Curator of the Economic Collections.

REPORT OF THE DIRECTOR OF THE LABORATORIES

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report.

The position of Director of the Laboratories at the New York Botanical Garden was officially assumed by me on October 1, 1911. I was, however, on the ground and at work during the two weeks preceding that date.

The Laboratories

The room on the upper floor of the museum building known as the Morphological Laboratory has been refitted and arranged as a general laboratory for research in morphology and cytology. This task took several weeks of my time. Six working desks have been installed, gas connections have been made and Welsbach lamps and blue globe light filters provided. This equipment greatly facilitates microscopic studies, especially on cloudy days and in the hours of late afternoon, and is a provision which is necessary for the best results when high power objectives are in use.

Microtomes, paraffin ovens, and a drying oven have been placed on a large table near the center of the room. At the rear of the room the several wall cases contain the various reagents and chemicals needed for investigation in the laboratory. Shelving has been placed in the dark room which will be utilized chiefly as a store room. The chemical laboratory has also been overhauled in some degree with the aim of securing the best facilities for work.

In arranging the laboratories the equipment at hand was utilized to full extent. Almost no new apparatus has been purchased and the total expenditure for supplies has been small. The present equipment is quite adequate for the immediate needs. During the coming year some addi-

tional apparatus as well as working supplies will be necessary.

In addition to the laboratories, the space in the propagating houses set aside by your direction for the needs of our personal and student investigations has been utilized especially in connection with studies in plant breeding, plant pathology and variegation in plants. The facilities thus afforded have already proven indispensable and will be needed in greater degree as the investigations progress. In connection with the greenhouses, a work room would greatly facilitate the investigations.

Personal Investigations

I am planning to complete certain lines of study regarding the grass root fungus, *Sclerotium rhizodes*. My report of previous work on this fungus is to be published soon as a research bulletin of the Wisconsin Experiment Station. There are certain phases of the investigations as to infection through the seed, etc., which are incomplete and which I wish to continue. I also desire to make observations on the occurrence of this fungus and if it is present the extent of the injuries it does here in the region about New York City.

During the winter months I am completing a special study begun at the University of Wisconsin on the nature and behavior of the structures bearing the hereditary factors in the cells of *Carex aquatilis* both in the somatic divisions and in the divisions which precede the formation of the germ cells. The chromosomes in this plant are favorable for exact study. It is my plan to hybridize *Carex aquatilis* with *Carex stricta* and if successful to study the nuclear phenomena in the hybrids.

My own special interests and investigations will be directed chiefly to plant breeding. In the planning and the carrying out of my investigations, I am fortunate in having the cooperation of Professor R. A. Harper, of Columbia University.

The present plan for the investigations in plant genetics embraces the following aims:

1. To follow out certain definite lines of study. Already several lines of research are under way. Seeds have been collected, cuttings secured, seedlings started, etc., especially in reference to work on chicory, *Ligustrum*, and *Mirabilis*.

2. To grow a number of plants to determine from their behavior whether they are suitable for future experimentation.

3. To provide problems in plant genetics for students who may desire such opportunity for investigation.

4. To secure and grow in a certain degree plants that are of peculiar and particular educational value in the study of plant genetics.

5. To supplement both by personal and student investigation, the field experimentation with necessary morphological and cytological studies. This latter work can be done during the winter months when the actual growing of plants is confined to greenhouses.

Meteorological Records

In the taking and the recording of these records, I have followed the plan employed by the former Director of the Laboratories. I have supplied a monthly summary of the meteorological records for publication in the Garden JOURNAL.

Conference Meetings

Monthly conferences of the scientific staff and students of the Garden have been held as follows:

Acting under your direction, the last two conferences have been held on the first Monday instead of the first Wednesday in the month, and invitations bearing the date and program of each conference have been mailed to members of the botanical staff at Columbia University, Barnard College and the Teachers College.

A summary of the topics as presented at the conferences has been supplied for publication in the Garden JOURNAL.

Morphological Grounds

Pursuant to your request, I am planning some extension to the collections of living plants in the Morphological Grounds. In addition to the present plantings I consider it of special interest (1) to grow plants that illustrate various methods of pollination, (2) to grow some of the "chimeras," "graft hybrids" or so called "mixed fruits," and (3) to exhibit certain hybrids that are of special educational value.

To the collection of marsh plants I wish to add a colony of *Carex aquatilis* for personal study as well as for the general interest which it may have.

Students and Investigators

The persons formally enrolled for investigation during the past year are included in the following groups:

1. Students in plant chemistry. Professor William J. Gies and Dr. Ernest D. Clark, of the Biochemical Department of Columbia University, offer a course in the chemical physiology of plants, which is given at the chemical laboratory of the Garden. Professor Gies also visits the Garden laboratory in the capacity of consulting chemist to advise with any persons having problems in plant chemistry.

2. Research students in botany from Columbia University. Professor R. A. Harper, Torrey Professor of Botany at Columbia University, is present at the laboratories during a part of each week and I am cooperating with him in assisting and advising his students who are working at the Garden laboriatores.

3. Investigators holding scholarships.

4. Students registered only at the Garden and pursuing investigations independently or under direction of various members of the Garden staff.

Besides the above there have been many persons whose studies in the herbaria, library, laboratories or grounds have not been sufficiently extended to warrant formal enrollment as students.

In the following list, the more complete biographical data are given for *new students only*. For all others, only the degree, the position held at present or last held, and the problem which is under investigation are recorded.

†Andrews, Albert Le Roy. Ph.D., Kiel, 08. Instructor in Cornell University.
Taxonomy of bryophytes.

†Benedict, Ralph Curtiss. Ph.D., Columbia Univ., 11; Lecturer in Botany, Fordham Univ. School of Medicine; Instructor in Botany, N. Y. Univ. Summer School and Collegiate Div.
Comparative morphology and classification of ferns.

Bristol, Warren Edwin. Waltham, Vermont, July 17, 1886; B.A., Middlebury College, 1907; Instructor in Biology, Middlebury Coll., 07–10; Instructor in Syrian Protestant College, Beirut, Syria, 10–11; Educational Director, East Side Y. M. C. A., N. Y. City, 11–.
Starches of drug plants; biological chemistry; taxonomy of phanerogams.

Britton, Mrs. N. L. N. Y. City Normal College, 75; Unpaid assistant in N. Y. Bot. Garden.
Morphology, taxonomy of bryophytes.

Broadhurst, Jean. A.M., Columbia Univ., 08; Instructor in Botany, Teachers College, Columbia Univ.
Taxonomy of ferns.

Butler, Bertram Theodore. A.M., Columbia Univ., 09; Botanist with Continental Rubber Co., N. Y. City.
Rubber producing plants.

†Clark, Ernest Dunbar. Ph.D., Columbia Univ., 10. Instructor in Biological Chemistry, Columbia Univ.
Problems in plant chemistry.

Coker, William Chambers. Ph.D., Johns Hopkins Univ., 01 Professor of Botany, State Univ. of N. Carolina.
Flora of North Carolina.

*Corry, Robert Thomas.
Physiological chemistry of plants.

* Registered at Columbia University.
† Research Scholarship.

*†Dodge, Bernard Ogilvie. Ph.B., Univ. of Wisconsin, 09. Research Assistant, Columbia Univ.

Morphology and taxonomy of Ascobolaceae.

†Eggleston, Willard Webster. B.S., Dartmouth, 91. Forest Service, U. S. Dept. of Agric.

Taxonomy of Pomaceae and Prunaceae.

Fairman, Charles Edward. A.M., M.D., St. Louis Medical College, 77; Practising physician, Lyndonville, New York.

Mycology; taxonomy of Lophiostomataceae.

†Fink, Bruce. Ph.D., Minnesota Univ., 99. Prof. of Botany, Miami University, Ohio.

Classification of lichens.

*Fromme, Fred D. St. Paris, Ohio, Apr. 2, 1886; Ohio State University, 04–05; Winona Technical Institute, Indianapolis, 07; South Dak. State College, 10–11; B.S., 11; Assistant in Botany, South Dak. Coll., 10–11; Assistant in Botany, Columbia Univ., 11–.

Methods of growing the grain rusts.

*Hare, Raleigh Frederick. M.S., Ala. Polytechnic Inst., 93; Prof. of Chemistry, N. Mexico Agric. College.

Chemical physiology of plants.

Kennerly, Martha Mason. B.S., Adelphi Coll., Brooklyn. Instructor in Botany, Normal College, N. Y. City.

Taxonomy of the bryophytes.

*Kern, Frank Dunn. Ph.D., Columbia Univ., 11; Associate Botanist, Purdue Univ. Agric. Exp. Station.

Mycology; morphology and life history of rusts; monograph of the genus Gymnosporangium.

Kupfer, Elsie Mabel. Ph.D., Columbia Univ., 07; Head Department of Biology, Wadleigh H. S.

Variegation in Ligustrum and Abutilon.

*Liebovitz, Sidney. A.B., Columbia Univ., 09; Research student, Columbia Univ.

Organic and physiological chemistry.

Maxon, William R. Ph.B., Syracuse Univ., 98. Assistant Curator, U. S. Nat. Museum.

Taxonomy of ferns.

ROBINSON, WINIFRED JOSEPHINE. Ph.D., Columbia Univ., 11. Instructor in Botany, Vassar College, N. Y.
Taxonomy of ferns.

*ROSE, ANTON RICHARD. M.S., Scheffield Scientific School Laboratories of the Yale Grad. School. Assistant in Biological Chemistry, Columbia Univ.
Biological Chemistry.

*SCHWARZE, CARL ALOIS. A.M., Columbia Univ., 11. Assistant in Botany, Columbia Univ.
Mycology, taxonomy and cytology of Perisporiaceae.

THOM, CHARLES. Ph.D., Missouri State Univ., 99. Mycologist, Storrs Agric. Exp. Sta.
Organic agents in cheese ripening.

*TOPP, EMILY PHILIPPINA. A.B., Normal College of N. Y. City, 09; Laboratory assistant, Normal Coll., 09–11: Woods Hole, summer, 10; Registered at Columbia, 09–.
Variegation in Miscanthus.

WILKINS, LEWANA. B.S., Wellesley Coll., 01; Teacher of Biology, Eastern Dist. H. S., Washington, D. C.
Taxonomy of flowering plants.

*WOMACK, MARY DOUGLAS. B.S., Adelphi Coll., Brooklyn, 99; Teacher in Biology, Wadleigh H. S.
Phytopathology.

Respectfully submitted,
A. B. STOUT,
Director of the Laboratories.

REPORT OF THE LIBRARIAN

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1911.

A census of the library at the end of the year shows that the number of bound volumes is 23,578, an increase of 639 volumes since the last report. The principal accessions have been listed from time to time in the Garden JOURNAL, as heretofore; most of them have been purchased on the account of the special book fund, but 27 volumes have been received as gifts. During the year 568 volumes have been bound; of this number, 54 are the property of Columbia University, deposited with the Garden.

The following publications should be added to the list of periodicals received regularly by the Garden, which appeared as an appendix to my last annual report (BULLETIN 7: 325–347):

American Fern Journal, Port Richmond, N. Y.

Charleston. College of Charleston Museum, Charleston, S. C. *Contributions.*

London. Royal Colonial Institute, London, England. *United Empire* (replacing *Proceedings*).

Nassauischer Verein für Naturkunde, Wiesbaden, Germany. *Jahrbücher.*

Washington. Academy of Sciences, Washington, D. C. *Journal.*

And the following should be omitted from the list:

Biltmore Botanical Studies.

Botanische Zeitung.

Connecticut Academy.

Paris. Société Linnéenne. *Bulletin Mensuel.*

Revue des Cultures Coloniales.

Vick's Illustrated Monthly Magazine.

Respectfully submitted,

JOHN HENDLEY BARNHART,

Librarian.

REPORT OF THE SUPERINTENDENT OF BUILDINGS AND GROUNDS

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1911.

Regulating and Grading

The greater portion of this work was done on the eastern side of the Bronx River. The section north of Power House No. 2, running about 900 feet north from the eastern driveway to the Garden line of the Boulevard, was graded and the top surface sown with grass seed. The surplus of this was used in the low land to the west. The section between Conservatory Range No. 2 and Power House No. 2 was graded, top dressed, and sown with grass seed.

The valley around the Japanese Cherry Tree Collection was prepared for planting and both sides of the new road leading from the stable road to the Boulevard were graded and prepared for grass seed.

5,000 cubic yards of soil have been filled in on the north side of the Scott Avenue Bridge. This soil was carted in by contractors doing work outside the Garden, who were looking for a convenient dumping place, the same being delivered and graded to our satisfaction at the contractors' expense.

We excavated about 150 cubic yards of soil for the foundation of an additional section of Conservatory Range No. 2. This ground was used in grading the eastern side of the conservatories. We extended the Nursery to a distance measuring about 150 by 200 feet by taking in part of the swamp section lying to the west of service path. We removed 3,103 loads of earth, 4,199 loads of top soil and 4,307 loads of stone were moved and used in building paths.

Drainage

In this class of work we have laid about four hundred feet of six-inch pipe on the western side of the new road, also four catch-basins on the western side of the new road and three catch-basins on the eastern side. We have extended the twelve-inch pipe drainage of Power House No. 2 seventy-five feet toward the river.

Roads and Paths

The unfinished path, about 850 feet long, on the northeast end of the Garden was surfaced with screenings and 465 feet of unfinished path on the north side of the stable was also screened. A path 900 feet long and ten feet wide was constructed north of Power House No. 2 and is now ready for screening. To the north of the Chestnut Bridge and on the east side of the Bronx River a path 860 feet long with a branch of 250 feet was built and is now ready for surfacing. A two-hundred-foot path running west of the Chestnut Bridge has been constructed and is now ready for screening. Running north from Long Bridge a path 1,350 feet long has been constructed on the east side of the river. Part of this path runs along the water edge with a wall five hundred feet long and five feet high, which is now ready for screening.

In the section of the Japanese Cherry Tree Collection a 1,235-foot path has been completed, and 312 feet of path completed around the north side of Conservatory Range No. 2.

1,550 feet on the east side and 1,350 feet on the west side of the new road and twenty-six feet of cross-path have been constructed and are now ready for screening. A path 180 feet long has been completed at the Propagating Houses. A ten-foot cross-path twenty-five feet long has been constructed in the Fruticetum and is ready for surfacing. A cross-path 65 feet long has been completed in the upper end of the Economic Garden.

We have constructed 8,453 feet of new paths and 1,292 feet of this amount are completed.

Extension of Water Supply

About eight hundred feet of six-inch water pipe have been laid on the west side of the new road. One fire-hydrant and four hose-taps were connected to the main.

Guard Rails

An addition of 5,220 feet of one-inch guard rail two rails high have been erected on the edges of paths and trails in the Hemlock Grove. About four hundred feet of one-inch rail two rails high have been erected along the path on the south side of Lake No. 1. On paths leading to the South Gate, we have erected about 850 feet of one-inch one-rail fence and about 450 feet of one-inch one-rail fence on the path leading from the Elevated Approach to Conservatory Range No. 1 and 355 feet of one-inch one-rail fence on the north side of the 200th street path. Around the beds in front of Conservatory Range No. 1, we have erected 800 feet of three-quarter-inch pipe fence one rail high.

Buildings

The interior of Conservatory Range No. 1, houses nos. 1, 6, 7, 8, and 9 have been painted. In house no. 1, a scaffold was erected eighty-four feet high, which enabled the painters to accomplish the work. The basement of the museum building was also painted. All necessary repairs were made by the carpenters in advance of the painting of Conservatory Range No. 1. Two herbarium cases and two bookcases have been built for the herbarium. Considerable repairing has been done throughout the buildings of the Garden by the mechanics.

A concrete floor has been constructed in the carriage house fourteen feet six inches by twenty-seven feet six inches; and two concrete approaches, one ten by twenty-seven feet and the other ten by fourteen feet six inches. A Fairbanks scale for weighing purposes has been erected near Power House No. 1.

We have purchased one horse and carriage complete.

The expenditures during the year for feed, the shoeing of horses, repairing harness, and minor details have amounted to $1,017.28.

Grounds

Except during the months of July and August we had one City officer to protect our grounds. On Sundays and holidays during these months we have had an additional mounted officer who patrolled the Hemlock Grove in the afternoons and evenings. We have also had two special keepers protecting the grounds with an addition of ten guards on Sundays and holidays during the summer months. The average number of visitors during the warm months averaged about 20,000, with the exception of the first two Sundays in July when that number was greatly increased. Owing to the vigilance of the employees there has been little damage done to the plantations this season.

Owing to the scarcity of water and the dry season of this year the Water Department notified us that all water fountains in the Garden must be cut off. They allowed us later the use of two drinking fountains for visitors.

During the drought the Upper Lake and the Aquatic Garden became dry. It was necessary, therefore, to purchase a gasoline engine and pump, and about 780 feet of pipe to pump water from the Bronx River into the Upper Lake. We pumped at the rate of 4,500 gallons an hour at an average of fourteen hours each day, six days a week. We allowed the water to flow at intervals from the Upper Lake into the other lakes.

We are now using the same engine for sawing cord-wood, which is to be used for heating the propagating houses.

Respectfully submitted,

ARTHUR J. CORBETT,

Superintendent of Buildings and Grounds.

SCHEDULE OF EXPENDITURES DURING THE YEAR 1911, UNDER APPROPRIATIONS

1. CITY MAINTENANCE ACCOUNT.. .... $85,994.64

Salaries and Wages

Appropriated.....	67,860.00
Expended.	67,860.00

General Supplies

Appropriated.....	2,000.00	
Transferred from Fuel.....	500.00	2,500.00
Expended.....		2,500.00

Materials for Repairs and Replacements by Departmental Labor

Appropriated.....	1,000.00	
Transferred from Fuel.....	500.00	1,500.00
Expended.....		1,500.00

Repairs and Replacements by Contract or Open Order

Appropriated.	500.00	
Transferred from Forage, Shoeing and Boarding Horses.....	300.00	800.00
Expended.....		799.41
Balance..		.59

Fuel

Appropriated.....		12,000.00
Less — Transferred to General Supplies.....	500.00	
Less — Transferred to Materials for Repairs and Replacements by Departmental Labor.....	500.00	1,000.00
		11,000.00

Expended—Contracts	9,917.06	
Open market orders	1,079.35	10,996.41
Balance		3.59

Contingencies

Appropriated		495.00
Expended		495.00

Telephone Service

Appropriated		100.00
Expended		94.05
Balance		5.95

Forage, Shoeing and Boarding Horses

Appropriated	1,114.64	
Less—Transferred to Repairs and Replacements by Contract or Open Order	300.00	814.64
Expended		814.64

Apparatus, Machinery, Vehicles, Harness, etc., including Care and Storage

Appropriated	925.00	
Expended	921.89	
Balance	3.11	
Total Expended — City Maintenance Account		85,981.39
Balance		13.25

2. Construction and Equipment

Old Account, 1910

1911, January 1, Balance	1,874.25	
Premiums	34.63	1,908.88
Expended—Contracts paid	1,832.25	
Open market orders	75.00	1,907.25
Balance		1.63

Old Account, 1911

1911, January 1, Balance	38,812.06	
Premiums	302.33	39,114.39

Erection of Greenhouses

Appropriated	25,000.00	
Premiums	184.85	
		25,184.85
Expended—Contracts Paid	24,885.00	
Engineer's pay-rolls	74.19	24,959.19
Balance		225.66

Construction and Completion of Path System

1911, January 1, Balance	6,024.68
Premiums	47.39
	6,072.07
Expended—Salaries and labor	6,062.50
Balance	9.57

Rock Excavation for Paths

1911, January 1, Balance	2,343.43
Premiums	20.94
	2,364.37
Expended—Labor	2,353.50
Balance	10.87

Earth Excavation for Paths

1911, January 1, Balance	1,911.24
Premiums	17.29
	1,928.53
Expended—Salaries and labor	1,920.50
Balance	8.03

Pipe for Connecting Drains

1911, January 1, Balance	32.71
Expended—Open market orders	31.00
Balance	1.71

Improving Banks along Driveways and Paths

Appropriated		1,500.00
Premiums		13.65
		1,513.65
Expended—Salaries and labor		1,506.50
Balance		7.15

Purchase and Erection of Railings along Paths

Appropriated		2,000.00	
Premiums		18.21	
		2,018.21	
Expended—Contracts paid	1,272.00		
Open market orders	270.00		
Labor	469.00	2,011.00	
Balance		7.21	
Total expended—old account, 1911			38,844.19
Balance			270.20

New Account, 1911

1911, July 25, Appropriation	49,800.00	
Premiums	———	49,800.00

Construction of a Boundary Fence

Appropriated	20,000.00
Expended	———
Balance	20,000.00

Construction of New Walks and Railings along Walks

Appropriated		6,000.00	
Premiums		———	
		6,000.00	
Expended—Contract liabilities	4,073.75		
Engineer's pay rolls	36.66		
Labor	34.00	4,144.41	
Balance		1,855.59	

Rock and Earth Excavations within Grounds

Appropriated	4,500.00	
Premiums		
	4,500.00	
Expended—Salaries and labor	1,520.75	
	2,979.25	

Construction of Masonry Retaining Walls at Boulevard Entrance and Masonry Steps at Power House

Appropriated	1,300.00	
Expended		
Balance	1,300.00	

Erection of a Pergola

Appropriated	2,500.00	
Expended		
Balance	2,500.00	

New Cases for Museum Building

Appropriated	3,000.00	
Premiums		
	3,000.00	
Expended—Open market orders	900.00	
Balance	2,100.00	

Erection of an Additional Greenhouse

Appropriated	12,500.00	
Expended		
Balance	12,500.00	
Total expended—New account, 1911		6,565.16
Balance		43,234.84

3. Special Garden Accounts

Exploration Fund

Subscribed 1901	2,050.00	
Refund—Balance on draft	87.59	
Subscribed 1902	2,130.00	
Refunds—Unexpended balances	180.56	
Subscribed 1903	1,565.00	
Refunds—Unexpended balances	275.11	
Subscribed 1904	3,183.45	
Refunds—Unexpended balances	110.50	
Subscribed 1905	2,575.00	
Sale of duplicate palms	100.00	
Refund—part of expenses—Exploration to the Bahamas	125.00	
Subscribed 1906	1,050.00	
Subscribed 1907	2,510.00	
Refunds—Unexpended balances	529.84	
Subscribed 1908	3,930.00	
Refund—Unexpended balance	14.49	
Subscribed 1909	4,410.00	
Refund—Unexpended balance	60.20	
Subscribed 1910	4,100.00	
Refund—Unexpended balance	54.59	
Subscribed 1911	5,675.00	
Refunds—Unexpended balances	113.73	34,830.06
Expended 1901	2,130.95	
Expended 1902	1,258.32	
Expended 1903	2,880.72	
Expended 1904	2,878.28	
Expended 1905	3,003.37	
Expended 1906	1,027.25	
Expended 1907	2,274.84	
Expended 1908	3,912.13	
Expended 1909	5,091.22	
Expended 1910	4,579.70	
Expended 1911	5,793.03	34,829.81
Balance		.25

Museum and Herbarium Fund

Subscribed 1901	1,800.00	
Subscribed 1902	655.00	
Refund (advance charges on specimens account of R. S. Williams)	131.09	
Subscribed 1903	1,405.00	
Sale of specimens	29.50	
Subscribed 1904	100.00	
Subscribed 1906	2,550.00	
Subscribed 1908	1,575.00	
Subscribed 1909	200.00	
Subscribed 1910	800.00	
Subscribed 1911	1,400.00	
Sale of specimens	225.00	10,870.59
Expended 1901	1,546.19	
Expended 1902	1,024.96	
Expended 1903	1,437.63	
Expended 1904	100.00	
Expended 1906	2,224.57	
Expended 1907	250.00	
Expended 1908	1,646.80	
Expended 1909	177.11	
Expended 1910	822.61	
Expended 1911	1,571.23	10,801.10
Balance		69.49

Plant Fund (Conservatory Fund)

Subscribed 1900	2,110.00
Subscribed 1901	25.00
Refund—Balance on draft	15.27
Subscribed 1902	486.55
Refund—Unexpended balance	9.70
Subscribed 1903	200.00
Sale of duplicate palms	100.00
Sale of plants	78.00
Sale of palms 1904	125.00
Subscribed 1908	260.00
Subscribed 1909	550.00
Subscribed 1910	1,135.00

Subscribed 1911	910.00	6,004.52
Expended 1900	710.44	
Expended 1901	1,437.42	
Expended 1902	404.41	
Expended 1903	447.66	
Expended 1904	121.21	
Expended 1908	245.65	
Expended 1909	133.28	
Expended 1910	1,500.74	
Expended 1911	989.28	5,990.09
Balance		14.43

Special Book Fund

Subscribed 1899	4,950.00	
Subscribed 1901	1,825.00	
Subscribed 1902	2,265.00	
Subscribed 1903	1,315.00	
Special contribution from Mr. Andrew Carnegie	1,997.88	
Sale of books	59.60	
Refund—Balance on drafts	20.93	
Subscribed 1904	1,540.00	
Sale of duplicate books	15.15	
Subscribed 1905	2,175.00	
Sale of duplicate books	25.50	
Subscribed 1906	310.00	
Subscribed 1907	100.00	
Subscribed 1908	3,130.00	
Subscribed 1909	1,850.00	
Subscribed 1910	1,465.00	
Subscribed 1911	750.00	
Refund—Overcharge on money order	.30	23,794.36
Expended 1899	1,916.65	
Expended 1900	2,395.28	
Expended 1901	2,463.02	
Expended 1902	2,256.25	
Expended 1903	3,397.75	
Expended 1904	1,031.92	
Expended 1905	2,178.99	

Expended 1906	748.29	
Expended 1907	195.28	
Expended 1908	2,760.36	
Expended 1909	720.71	
Expended 1910	2,743.63	
Expended 1911	898.83	23,706.96
Balance		87.40

Summary—Special Garden Accounts

Balance from 1910	350.06	
Total contributed 1911	8,735.00	
Sales and refunds	339.03	9,424.09
Total expended 1911		9,252.52
Balance		171.57

4. Special Income—Garden Accounts

Income of Lydig Fund (Publications)		4,000.00	
Appropriated:			
Subscriptions to "North American Flora"	993.89		
Sales of publications	1,151.15	2,145.04	
Refunds		69.31	6,214.35
Expended—Shortage from 1910		661.88	
Expended—1911—Salary for editorial assistance	360.00		
Miscellaneous	4,451.04	4,811.04	5,472.92
Balance			741.43

Income of Mills Fund 2,700.00

Exploration and Collecting

Appropriated		500.00
Less—Transferred to Lectures and Lantern Slides		40.00
		460.00
Expended		450.00
Balance		10.00

Horticultural Prizes

Appropriated		400.00
Expended		386.24
Balance		13.76

Laboratories

Appropriated		500.00
Expended—Tropical Laboratory	295.42	
Miscellaneous	283.60	579.02
Shortage		79.02

Lectures and Lantern Slides

Appropriated		500.00
Transferred from Exploration and Collecting		40.00
		540.00
Less—Transferred to Library		200.00
		340.00
Expended		333.16
Balance		6.84

Library

Appropriated	500.00		
Transferred from Lecture and Lantern Slides	200.00		
Transferred from Research Scholarships	150.00	850.00	
Expended		812.76	
Balance		37.24	

Research Scholarships

Appropriated	300.00		
Less—Transferred to Library	150.00	150.00	
Expended		150.00	
Total expended—Income of Mills Fund			2,711.18
Shortage			11.18

Income of Stokes Fund (Preservation of Native Plants)

Appropriated	300.00
Expended	20.40
Balance	279.60

Income of Students Research Fund (Aid for Students Research)

Appropriated	400.00
Expended	225.00
Balance	175.00

Summary—Special Income, Garden Accounts

Total appropriated	7,400.00	
Subscriptions and sales of publications	2,145.04	
Refunds	69.31	9,614.35
Total expended		8,429.50
Balance		1,184.85

5. General Income—Garden Accounts

Assistance for Treasurer

Appropriated	180.00
Expended	180.00

Circulars for Membership

Appropriated	300.00
Expended	296.24
Balance	3.76

Contribution to Maintenance, to Supplement City Appropriations	14,590.00	
Less—Transferred to other accounts	390.00	14,200.00

Special Assistance

Appropriated	1,500.00	
Less—Transferred to Museums and Herbarium	100.00	

Less—Transferred to Photography	125.00	
Less—Transferred to Contingent Fund	150.00	375.00
		1,125.00
Expended—Salaries	850.00	
Miscellaneous	273.75	1,123.75
Balance		1.25

Laborers and Gardeners

Appropriated	9,120.00	
Transferred from Contingent Fund	60.00	9,180.00
Expended—Weekly pay rolls	8,322.50	
Extra guard duty and overtime	382.47	
Painters (special)	294.00	
Salaries—gardeners	178.68	9,177.65
Balance		2.35

Contingent Fund

Appropriated	1,300.00	
Transferred from special assistance	150.00	1,450.00
Less—Transferred to Investigations at other Institutions	45.00	
Less—Transferred to Museums and Herbarium	40.00	
Less—Transferred to Photography	80.00	
Less—Transferred to Laborers and Gardeners	60.00	225.00
		1,225.00
Expended		1,223.28
Balance		1.72

Supplies

Appropriated	2,670.00	
Expended	2,667.84	
Balance		2.16
Total Expended—Contribution to Maintenance		14,192.52
Balance		7.48

Payment of Docent

Appropriated	240.00	
Expended	240.00	

Expenses of Consulting Chemist

Appropriated	300.00	
Expended	300.00	

Investigations at other Institutions

Appropriated	200.00	
Transferred from Contingent Fund	45.00	245.00
Less—Transferred to Insurance		50.00
		195.00
Expended		190.20
Balance		4.80

Insurance

Appropriated		450.00
Transferred from Investigations at other Institutions		50.00
		500.00
Expended		494.10
Balance		5.90

Salary—Membership and Publications Clerk

Appropriated	960.00
Expended	960.00

Museums and Herbarium

Appropriated	1,000.00	
Transferred from Special Assistance	100.00	
Transferred from Contingent Fund	40.00	1,140.00
Expended—Expenses of the Curator of the Economic Collection	600.00	
Miscellaneous	539.32	1,139.32
Balance		.68

Photography

Appropriated	300.00	
Transferred from Special Assistance	125.00	
Transferred from Contingent Fund	80.00	505.00
Expended—Salary of photographer	275.00	
Miscellaneous	228.76	503.76
Balance		1.24

Salary of Secretary

Appropriated	1,500.00
Expended	1,500.00

Summary—General Income, Garden Accounts

Total appropriated	20,020.00
Total expended	19,996.14
Balance	23.86

6. Recapitulation—Garden Accounts

Total appropriated	27,420.00	
Subscriptions, sales and refunds	2,214.35	29,634.35
Total expended		28,425.64
Balance		1,208.71

Expended from Funds of the Garden

Special Garden Accounts 1911	9,252.52	
Garden accounts	28,425.64	
Total		37,678.16

Respectfully submitted,

WALTER S. GROESBECK,
Accountant.

E. and O. E.

NEW YORK, January 8, 1912.

REPORT OF THE CHAIRMAN OF THE SCIENTIFIC DIRECTORS

To the Board of Managers of the New York Botanical Garden.

Gentlemen: I have the honor to submit the following report from the Scientific Directors for the year 1911.

The meetings of the Board have occurred regularly during the year and the scientific work of the Garden has proceeded without interruption.

Among the events of special interest, may be mentioned the expedition of the U. S. ship "Albatross" to the Pacific coast of Mexico, upon which the Garden was represented, and by which its collections were greatly enriched. The Cactaceae obtained on this expedition were specially noteworthy, in connection with the study of this family, on which the Director-in-Chief is now engaged. A number of excellent colored drawings of cactuses have been made by Miss Eaton, who is still engaged in this work.

With the appointment of Dr. Robert A. Harper as Professor of Botany at Columbia, and his consequent addition to our Board, the Garden staff has been further strengthened by the appointment as Director of the Laboratories, of Mr. A. B. Stout, Professor Harper's former associate at the University of Wisconsin. Important improvements in the equipment of our laboratories have been made under Mr. Stout's direction.

Our explorations of the year have included, besides the expedition of the "Albatross" to western Mexico, already mentioned, one to Cuba by the Director-in-Chief, another to the same island by Dr. Shafer, one by Dr. Murrill to the Pacific coast of the United States, one into Utah by Dr. Rydberg, and we cooperated in one to the Caicos and Turks Islands by Dr. Millspaugh, and one into the southeastern United States by Professor Ezra Brainerd, for the

special study of the genus *Viola*. The Director-in-Chief has also spent some time in Europe, in the study of critical species.

The reception that continues to be accorded our publications is gratifying to the Directors, both from a financial and a scientific viewpoint. Several of these publications in 1911 have been of exceptional value.

Scientific data of considerable importance have been obtained by special students during the year, from the collections in our economic museum.

The educational work of the year, in addition to that recorded by the Director of the Laboratories, has included the usual spring and fall lectures to school children and public lectures during the summer, as well as in the spring and autumn, as heretofore, the attendance at all of which has shown a satisfactory increase. Interest in the work of the docent in guiding visitors about the Garden, has greatly increased during the past year, so that it is thought desirable to assign a second officer to this duty. The installation of large photographs, representing important types of the world's vegetation, upon the walls of the Museum, is regarded a work of great educational importance.

A plan has been inaugurated for continuing the work for the preservation of our wild flowers, through the publication in the Garden JOURNAL of colored plates of those species regarded as being in greatest danger of destruction, with notes upon their life history and suggestions as to their protection.

Mr. Norman Taylor, one of our energetic assistant curators, has been called by the Brooklyn Botanic Garden to become the assistant of Dr. Gager, the Director of that institution.

Dr. Arthur Hollick has been absent during half of the year, by permission of the Board, to assist the United States Geological Survey in its study of Alaskan fossil plants.

At the October meeting, Dr. William Gies, in association with the Chairman, was appointed a delegate to the Eighth International Congress of Applied Chemistry, which will convene in September next, in Washington and New York.

In commenting upon the slight increase in the city appropriation for maintenance during the year 1912, we have to say again, as we did last year, that much of the scientific work of the Board, during the year 1911, has been made possible only through the liberal response to the appeal of the Director-in-Chief for special contributions.

Respectfully submitted,

H. H. Rusby,

Chairman.

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS FOR THE YEAR 1911

To the Board of Managers of the New York Botanical Garden.

Gentlemen: The number of new members who have qualified during the past year is 53. The number of annual members is now 804; life members 154; sustaining members 22; fellowship members 5.

Of these, 17 are now in arrears for dues for 1911, 11 are in arrears for 1910 and 1911, and 5 are in arrears for 1909, 1910 and 1911.

Dues have been collected to the amount of $9,090, which has been transmitted to the Treasurer as received.

A complete list of all classes of members to date is herewith submitted.

New York, January 8, 1912.

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Columbia University,
*Hon. Charles P. Daly,
*D. O. Mills,
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John D. Rockefeller,
*Cornelius Vanderbilt.

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Miss Helen M. Gould,
*Mrs. Esther Herrman,
*John S. Kennedy,
*Oswald Ottendorfer,
Lowell M. Palmer,
William Rockefeller,
*Wm. R. Sands,
*Wm. C. Schermerhorn,
Jas. A. Scrymser,
*Samuel Sloan,
Mrs. Antoinette Eno Wood.

*Deceased.

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Hon. Seth Low,
M. F. Plant,
Francis Lynde Stetson,
Miss Olivia E. Phelps Stokes,
Samuel Thorne,
Tiffany & Co.,
H. C. von Post.

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Dr. S. T Armstrong,
Mrs. H. D. Auchincloss,
Samuel P. Avery,
Samuel D. Babcock,
Geo. V. N. Baldwin,
Miss Cora F. Barnes,
Dr. John Hendley Barnhart,
Gustav Baumann,
Samuel R. Betts,
Miss Elizabeth Billings,
Miss Mary M. Billings,
Miss Catherine Bliss,
J. O. Bloss,
George Blumenthal,
George C. Boldt,
G. F. Bonner,
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J. Hull Browning,
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T. Morris Carnegie,
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Hugh J. Chisholm,
Hugh J. Chisholm, Jr.,
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Banyer Clarkson,
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William Colgate,
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Theodore Cooper,
Zenas Crane,
R. N. Cranford,
Melville C. Day,
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W. B. Dickerman,
James Douglas,
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Franklin L. Gunther,
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Homer Heminway,
Hancke Hencken,
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Harmon W. Hendricks,
Ferdinand Hermann,
Selmar Hess,
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B. Hochschild,
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Karl Hutter,
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Adrien Iselin, Jr.,
C. Oliver Iselin,
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Samuel Isham,
Wm. M. Ivins,
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A. C. James,
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Miss Louise Landgon Kane,
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H. Van Ransselaer Kennedy,
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Rudolph Keppler,
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Edward V. Z. Lane,
Woodbury Langdon,
Woodbury G. Langdon,
J. Langeloth,
Dr. G. Langmann,
Lewis H. Lapham,
Mrs. Lauterbach,
John Burling Lawrence,

Mrs. Lydia G. Lawrence,
Mrs. Samuel Lawrence,
Charles N. Lee,
Prof. Frederic S. Lee,
Mrs. Frederic S. Lee,
Marshall C. Lefferts,
Wm. H. Lefferts,
James M. Lehmaier,
Edward A. Le Roy, Jr.,
Arthur L. Lesher,
Dr. A. Monae Lesser,
Wm. H. Leupp,
Enamuel Levy,
Adolph Lewisohn,
Albert Lewisohn,
Miss Alice Lewisohn,
Philip Lewisohn,
Lowell Lincoln,
Frederick J. Lisman,
Wm. S. Livingston,
Wm. C. Lobenstine,
Frank J. Logan,
Mrs. Geo. de Forest Lord,
P. Lorillard, Jr.,
Miss Carlotta R. Lowell,
August Lueder,
Walther Luttgen,
Geo. L. McAlpin,
John J. McCook,
Mrs. W. H. McCord,
Henry P. McKenney,
John A. McKim,
James McLean,
Daniel W. McWilliams,
Geo. R. MacDougall,
Clarence H. Mackay,
Kenneth K. Mackenzie,
Malcolm MacMartin,
George H. Macy,
V. Everit Macy,

F. Robert Mager,
J. H. Maghee,
Pierre Mali,
Chas. Mallory,
Howard Mansfield,
Miss Delia W. Marble,
John Markle,
Dr. J. W. Markoe,
C. P. Marsh,
Chas. H. Marshall,
Edwin S. Marston,
W. R. H. Martin,
Charles D. Marvin,
George Massey,
William J. Matheson,
Francis Taylor Maxwell,
Robert Maxwell,
David Mayer,
Harry Mayer,
Effingham Maynard,
Mrs. Emma Mehler,
C. S. Mellen,
Herman A. Metz,
Edwin O. Meyer,
George A. Meyer,
Harry J. Meyer,
John G. Milburn,
Geo. M. Miller,
S. M. Milliken,
Alphonse Montant,
J. C. Moore,
Miss Anne Morgan,
Miss C. L. Morgan,
E. D. Morgan,
Geo. H. Morgan,
Wm. Fellows Morgan,
Mrs. Cora Morris,
Mrs. Dave Hennen Morris,
Henry Lewis Morris,
Louis R. Morris,

Geo. Austin Morrison,
Richard Mortimer,
Henry C. Mott,
Frank J. Muhlfeld,
Carl Muller,
John P. Munn,
Frank A. Munsey,
A. G. Nesbit,
Miss Catherine A. Newbold,
Miss Edith Newbold,
Frederic R. Newbold,
Wm. Nilsson,
Adolph S. Ochs,
E. E. Olcott,
Robert Olyphant,
Mrs. Emerson Opdycke,
Wm. S. Opdyke,
Mrs. Wm. Openhym,
William C. Orr,
Prof. Henry F. Osborne,
Augustus G. Paine,
S. S. Palmer,
Henry Parish, Jr.,
Mrs. Henrietta M. Parker,
Winthrop Parker,
James C. Parrish,
Chas. W. Parsons,
Mrs. Edwin Parsons,
John E. Parsons,
R. W. Paterson,
W. A. Paton,
O. H. Payne,
T. W. Pearsall,
Mrs. Sarah J. Parsons,
Mrs. Frederick Pearson,
Stephen H. P. Pell,
Chas. G. Peters,
Samuel T. Peters,
W. R. Peters,
Chas. Pfizer, Jr.,
Guy Phillips,
Henry Phipps,
Lloyd Phoenix,
Phillips Phoenix,
Gottfried Piel,
Michael Piel,
Henry Clay Pierce,
Winslow S. Pierce,
J. Fred Pierson,
Albert Plant,
John R. Planten,
Gilbert M. Plympton,
Chas. Lane Poor,
Abram S. Post,
Miss Blanche Potter,
Frederick Potter,
Chas. Pryer,
J. Harsen Purdy,
L. Putzel,
Percy R. Pyne,
Charles F. Quincy,
Dr. Edward Quintard,
Charles Raht,
Gustav Ramsperger,
Edmund D. Randolph,
S. Rawitser,
G. B. Raymond,
Geo. R. Read,
Wm. A. Read,
Miss Emily Redmond,
Geraldyn Redmond,
Stephen K. Reed,
Hon. Whitelaw Reid,
Geo. N. Reinhardt,
Chas. Remsen,
E. B. Reynolds,
Miss Serena Rhinelander,
Eben Richard,
E. A. Richard,
Samuel Riker,

Wm. J. Riker,
H. Dillon Ripley,
George L. Rives,
Dr. Wm. C. Rives,
Geo. I. Roberts,
Miss Mary M. Roberts,
Miss Jennette Robertson,
Julius Robertson,
Andrew J. Robinson,
M. Rock,
Alfred Roelker,
Edward L. Rogers,
Mrs. Jas Roosevelt,
W. Emlen Roosevelt,
Mrs. W. Emlen Roosevelt,
Hon. Elihu Root,
Carman R. Runyon,
Basil W. Rowe,
Jacob Ruppert,
Edward Russ,
Mrs. A. D. Russell,
John Barry Ryan,
Arthur Ryle,
Harry Sachs,
Paul J. Sachs,
Clarence Sackett,
Mrs. Russell Sage,
Daniel C. Sands,
Miss G. W. Sargent,
Herbert L. Satterlee,
Dr. A. T. Schauffler,
Carl Schefer,
Miss Mary E. Schell,
Mrs. H. M. Schieffelin,
Dr. Wm. J. Schieffelin,
Rudolph E. Schirmer,
Miss Jane E. Schmelzel,
D. Schnakenberg,
Henrich Schniewind, Jr.,
C. M. Schwab,
Henry F. Schwarz,
Geo. S. Scott,
Robert Scoville,
Alonzo B. See,
Edward M. Scudder,
Charles E. Seitz,
Prof. Edwin R. A. Seligman,
Jefferson Seligman,
E. W. Sells,
Alfred Seton,
George R. Sheldon,
Arthur M. Sherwood,
Wm. Shillaber,
Henry Siegel,
John W. Simpson,
Frank D. Skeel,
Francis Louis Slade,
Benson B. Sloan,
Samuel Sloan,
Mrs. Samuel Sloan,
Albert K. Smiley,
Daniel Smiley,
Chas. F. Smillie,
Dr. A. Alexander Smith,
Mrs. Annie Morrill Smith,
F. M. Smith,
Mrs. Geo. W. Smith,
H. Sanborn Smith,
R. A. C. Smith,
E. G. Snow,
E. G. Soltmann,
Mrs. Charlotte Sorchan,
W. M. Sperry,
I. M. Spiegelberg,
Paul N. Spofford,
Miss Anna Riker Spring,
J. R. Stanton,
James H. Stebbins,
James R. Steers,
Chas. H. Steinway,

Wm. R. Steinway,
Olin J. Stephens,
Benjamin Stern,
Louis Stern,
Alexander H. Stevens,
Frederic W. Stevens,
Dr. Geo. T. Stevens,
Lispenard Stewart,
Wm. R. Stewart,
Miss Clara F. Stillman,
Dr. D. M. Stimson,
James Stokes,
N. F. Straus,
Albert Strauss,
Chas. Strauss,
Frederick Strauss,
Isidor Strauss,
F. K. Sturgis,
Mrs. F. K. Sturgis,
Mrs. Geo. Such,
Mrs. James Sullivan,
Miss P. C. Swords,
Miss Mary Taber,
Henry W. Taft,
Edward N. Tailer,
James Talcott,
Leon Tanenbaum,
C. A. Tatum,
Miss Alexandrina Taylor,
George Taylor,
Henry R. Taylor,
Stevenson Taylor,
W. A. Taylor,
C. H. Tenney,
H. L. Terrell,
Jno. T. Terry,
Thomas Thacher,
Ernst Thalmann,
Miss M. J. Thayer,
Seth E. Thomas, Jr.,
David W. Thompson,
L. S. Thompson,
Dr. W. Gilman Thompson,
Jonathan Thorne,
Samuel Thorne, Jr.,
W. V. S. Thorne,
Myles Tierney,
Louis C. Tiffany,
James Timpson,
J. Kennedy Tod,
William Tousey,
C. D. Tows,
P. S. Trainor,
A. F. Troescher,
Frederick K. Trowbridge,
Dr. Alfred Tuckerman,
Paul Tuckerman,
Geo. E. Turnure,
Benjamin Tuska,
E. S. Twining,
Mrs. Eliza L. D. Tysen,
E. S. Ullman,
Theodore N. Vail,
Augustus Van Cortlandt,
Alfred G. Vanderbilt,
D. B. Van Emburgh,
E. H. Van Ingen,
Edgar B. Van Winkle,
Robert A. Van Wyck,
Richard C. Veit,
Thos. F. Vietor,
Frank Vincent,
Herman Vogel,
John Wagner,
Wm. I. Walter,
Artemus Ward,
Mrs. John Hobart Warren,
Thomas L. Watt,
E. H. Weatherbee,
F. Egerton Webb,

Mrs. John A. Weekes,
Chas. Wehrhane,
Camille Weidenfeld,
Charles H. Weigle,
Mrs. C. Gouveneur Weir,
Mrs. Samuel W. Weiss,
Charles W. Wells,
Mrs. John Wells,
Mrs. Robert E. Westcott,
Geo. Westinghouse,
Mrs. Alice T. Wheelock,
Dr. Wm. E. Wheelock,
Miss Caroline White,
Horace White,
John J. White, Jr.,
Miss Gertrude Whiting,
Clarence Whitman,
Miss Margaret S. Whitney,
Wm. Wicke,
Edward A. Wickes,
D. O. Wickham,
Mrs. I. T. Williams,
Mrs. Percy H. Williams,
Richard H. Williams,
W. P. Willis,
Charles T. Wills,
George T. Wilson,
Mrs. H. S. Wilson,
Miss Margaret B. Wilson,
Egerton Winthrop,
Grenville L. Winthrop,
Mrs. Robt. Winthrop,
Mrs. Frank S. Witherbee,
Dr. R. A. Witthaus,
Ernst G. W. Woerz,
S. Herbert Wolfe,
Emil Wolff,
Lewis S. Wolff,
Mrs. Cynthia A. Wood,
Henry R. Wood,
James Wood,
Prof. R. S. Woodward,
Mrs. William Woodward, Sr.
W. H. Woolverton,
P. B. Worrall,
Miss Julia Wray,
Mrs. J. Hood Wright,
A. Wurzburger,
Mrs. A. Murray Young,
Edw. L. Young,
Andrew C. Zabriskie,
Mrs. John E. Zimmermann,
August Zinsser,
Charles Zoller,
O. F. Zollikoffer.

REPORT OF THE TREASURER

NEW YORK, January 8, 1912.

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen: Herewith I submit a statement of my Receipts and Disbursements during the year 1911, and a Balance Sheet from my ledger as of December 30, 1911.

Respectfully yours,

C. F. Cox,

Treasurer.

Receipts

Balance as per last Annual Report		$ 7,625.40
Contributions of the City towards Development and Maintenance		90,023.71
Income from Investments:		
Credited General Income Account:		
5 per cent. on $50,000 Southern Railway Co. First Consolidated Mtge. Bonds	$ 2,500.00	
4.5 per cent. on $50,000 Ches. & Ohio R. R. Co. General Mtge. Bonds	2,250.00	
4 per cent. on $50,000 Erie R. R. Co. Prior Lien Bonds	2,000.00	
4 per cent. on $59,000 Erie R. R. Co. Penn. Collat. Trust Bonds	2,360.00	
4 per cent. on $50,000 Reading R. R. Co. Jersey Central Collat. Trust Bonds	2,000.00	
4 per cent. on $24,000 Northern Pacific R. R. Co. St. Paul & Duluth Division Bonds	960.00	
4 per cent. on $30,000 Northern Pacific Co. Gt. Northern, C. B. & Q. Collat. Trust Bonds	1,200.00	

4 per cent. on $10,000 N. Y. City 4 per cent. Stock of 1959	400.00	13,670.00
Credited Income of D. O. Mills Fund:		
6 per cent. on $50,000 Can. So. First Mtge. Extended Bonds	3,000.00	3,000.00
Annual Dues		8,110.00
Interest at 3 per cent. on balances with J. P. Morgan & Co.		159.44
Proceeds Sales of Merchandise		70.80
Fellowship Members' Fees		500.00
Sustaining Members' Fees		500.00
Subscriptions to "North American Flora," sales of Publications, etc., credited Income of David Lydig Fund		2,247.11
Contributions, etc., to Special Book Fund		750.30
Contributions, etc., to Plant Fund		910.00
Contributions, etc., to Exploration Fund		5,788.73
Contributions, etc., to Museum and Herbarium Fund		1,625.00
		$134,980.49

Disbursements

Expenses paid through Director-in-Chief:		
Account city appropriations	$90,023.71	
On General Account for vouchers paid	21,956.83	
Special Book fund for books	1,283.70	
Plant Fund for purchase of plants.	1,133.24	
Exploration Fund for specimens, etc.	5,721.53	
Museum and Herbarium Fund for purchases, etc.	1,500.59	
Income of Students' Research Fund for Grants	225.00	
Income of David Lydig Fund for Publications	4,318.80	
Income of D. O. Mills Fund for Sundries	3,454.99	
Income of Stokes Fund for Printing	20.40	129,638.79
Balance, Cash in hands of Treasurer		5,341.70

Ledger Balances, December 30, 1911.

Credit

Permanent Funds

Endowment Fund	$281,260.00	
Darius Ogden Mills Fund	50,000.00	
Fellowship Fees	11,000.00	
Life Membership Fees	20.750.00	
David Lydig Fund—Bequest of Chas. P. Daly	34,149.86	
Stokes Fund	3,000.00	
Students' Research Fund	2,984.50	
	3147.36	
Temporary Funds		
Special Book Fund for Library	152.68	
Plant Fund, for plants	76.78	
Exploration Fund	121.75	
Museum and Herbarium Fund	140.13	
Income of Students' Research Fund	318.16	
Income of Stokes Fund	518.73	$404,472.59

Debit

Investments

Net Cost of $50,000 Ches. & Ohio Ry. Co. Genl. Mtge. Bonds	$363,406.68
$50,000 Southern Ry. Co. 1st Consol. Mtge. Bonds	
$50,000 Erie R. R. Co. Prior Lien Bonds	
$59,000 Erie R. R. Co. Penn. Coll. Trust Bonds	
$50,000 Reading R. R. Co. Jersey Cent. Coll. Trust Bonds	
$24,000 Nor. Pac. R. R. Co. St. Paul & Duluth Div. Bonds	
$30,000 Nor. Pac. Gt. Nor. C. B. & Q. Coll. Trust Bonds	
$10,000 N. Y. City 4 per cent. Stock, 1959	
$50,000 Can. So. Ry. Co. First Mtge. Ext. Bonds	

Director-in-Chief, Working Fund....	25,000.00	
General Income Account, Balance borrowed from Permanent Funds .	8,079.96	
Income of D. O. Mills Fund, Balance borrowed from Permanent Funds.	147.35	
Income of David Lydig Fund, Balance borrowed from Permanent Funds.....	2,496.90	
Cash in hands of Treasurer.....	5,341.70	
	$404,472.59	$404,472.59

REPORT OF THE SPECIAL AUDITOR

Treasurer's Account for the Year 1911

66 Broadway,

New York, February 15, 1912.

James A. Scrymser, Esquire,
Chairman of the Finance Committee,
New York Botanical Garden,
New York City.

Sir: This is to certify that I have, by your direction, examined the books and accounts of the Treasurer of the New York Botanical Garden for the year nineteen hunded and eleven (1911), together with their proper vouchers, and that I find the balance sheet and the Treasurer's Statement of Receipts and Disbursements, attached hereto, to be correct.

I have also examined the various Investment Securities, and find the same to be as reported in the said Balance Sheet.

Respectfully submitted,

(Signed) J. L. Merrill,
Special Auditor.

DIRECTOR–IN–CHIEF'S ACCOUNT FOR THE YEAR 1911

66 Broadway,
New York, February 15, 1912.

James A. Scrymser, Esquire,
Chairman of the Finance Committee,
New York Botanical Garden,
New York City.

Sir: This is to certify that I have, by your direction, examined and audited the financial books and accounts of the Director-in-Chief of the New York Botanical Garden for the year nineteen hundred and eleven (1911), and that I find the same to be correct and the Cash Balance to be as stated in the Current Cash Book.

This auditing does not include the examination of the vouchers for either City Maintenance or Construction Work, paid for by the City, such vouchers having been found proper and in order by the City authorities and you having decided in 1904 that a further examination of them by me was unnecessary.

I have omitted, also, a detailed examination of the Annual Membership Dues Account, as per like instructions in 1904. These dues are received by the Director-in-Chief and forwarded by him to the Treasurer, the former keeping a detailed record of the same.

Respectfully submitted,
(Signed) J. L. Merrill,
Special Auditor.

VOL. 8 NO. 28

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN

[ISSUED NOVEMBER 23, 1912]

TABLE OF CONTENTS

PAGE

New Species from Bolivia, collected by R. S. Williams—II, by H. H. Rusby. [*Issued separately, in advance, 19 N, 1912*] 89

The Polyporaceae of Mexico, by W. A. Murrill. [*Issued separately, in advance, 20 N, 1912*] 137

Additions to the Paleobotany of the Cretaceous Formation on Long Island. No. III, by Arthur Hollick. [*Issued separately, in advance, 20 N, 1912*] 154

BULLETIN
OF
The New York Botanical Garden

Vol. 8 No. 28

New Species from Bolivia, Collected by R. S. Williams—2*

By H. H. Rusby, M.D.

Note.—The present publication will not complete the enumeration and description of Mr. Williams' new species. The ferns, grasses and orchids have not yet been studied. Quite a number of species are regarded as undescribed, but must wait for additional data. Several genera will also require description. It is proposed to take up these plants, together with a number of my own collection of 1885–1887, of Mr. Bang's, and other Bolivian collectors, in a future publication.

Amarantaceae†

Gomphrena Conwayi sp. nov.

Crown thick and woody, surmounting a long, straight, thick, vertical root, invested with a mass of white silky hairs, apparently resulting from the solution of the old leaf-bases. Stems very short, decumbent or ascending, densely massed. Leaves oblanceolate or spatulate, 5–15 mm. long, half or two-thirds as broad, rounded at the summit, gradually contracted into the petiole, very thick, glabrous above. Flowers apparently white, densely capitate at the ends of the branchlets. Bracts at the base of the heads closely appressed, sessile, unequal, slightly surpassing or not quite equalling the compressed flowers. Perianth-segments obtuse, slightly unequal, somewhat exceeding the anthers, lightly emarginate. Stamen-tube 2 mm. long, lightly lacerate and scarcely produced between the sessile anthers. Stigmas 2, subulate, acute, not equalling the stamen-tube.

"Near Juliaca, 12,500 ft. alt., May 12, 1902" (*No. 2519*).

* The first contribution under this title was in Bull. N. Y. Bot. Gard. Vol. 6, No. 22, pp. 487–517. Nov. 30, 1910.

† Omitted from Part 1.

Papilionaceae

Eriosema Conwayi sp. nov.

Further study has convinced me that *Nos. 9* and *117*, described as "*Eriosema* sp. nov.?," on page 516, Vol. 6, *Bull. N. Y. Bot. Gard.*, represent a previously unknown species, to which I assign the above name.

Mimosaceae

Inga expansa sp. nov.

Shortly and closely ferruginous; all parts very stout; entire leaf not seen, probably 3-jugate; petiole 10 cm. long, like the brachlets and rachis somewhat harshly tomentose and coarsely angled; internodes of the rachis 6 or 7 cm. long, the upper two-thirds winged, the wings narrowing gradually downward from near the top, where they are together 15–25 mm. broad; petiolules 4 or 5 mm. long, a single large gland between them on the rachis; leaflets 15–35 cm. long, 10–18 cm. wide, oval, or the largest angularly obovate, blunt, most of them slightly cordate at the base, thickish, rather harsh above, softly pubescent beneath, where the slender, terete midrib and about 20 pairs of secondaries are prominent, the latter diverging at a slight angle, lightly ascending and interarching near the margin; peduncle about 10 cm. long, the head short, broad and dense; calyx 2 cm. long, regularly infundibular, finely nerved, the teeth broadly ovate, obtusish; corolla nearly 3 cm. long, of same form as calyx but more slender, externally densely pilose, the hairs yellowish-white, strongly appressed; stamens very numerous, 6–7 cm. long, the filaments very slender, the anthers very small.

"A spreading tree, 30 ft. high; Charopampa, 1600 ft., Sept. 20, 1901" (*No. 753*).

Species near *I. Lindeniana* Benth.

Acacia rynchocarpa sp. nov.

(Specimen in fruit.)

Branchlets terete, gray-brown and, like the petioles, rachis, peduncles, etc., minutely puberulent. Leaves (only the upper seen) 7–15 cm. long, the petiole about one sixth as long as the rachis, sub-sulcate, bearing on its upper surface one or more small, stipitate, concave, dark-red glands, and on its lower surface one or more very small recurved prickles; rachis bearing similar but smaller prickles and upon its terminal portion several similar but sessile glands which are solitary between the pairs of petiolules; pinnae 2–6 cm. long, short petiolulate, with minute, rigid, acute stipellae; pinnules 25–50 pairs, sessile, 5 mm. long, about 1 mm. wide, inacquilateral, oblong-linear, obtuse, with truncate base, glabrous, the principal secondaries 5 or 6 on each side, lightly prominent on the lower surface; peduncles solitary in the axils,

2–6 cm. long, bearing a raceme of 3 to 6 legumes, their spreading pedicels about 3 cm. long and mostly a little longer than the stipes, at maturity nearly at a right angle with the latter, the persistent calyx teeth broadly triangular-ovate, obtuse. Legumes ferruginous and finely tomentose, 7 to 10 cm. long, 2–2.5 cm. wide, linear-oblong, the base sub-rotund and abruptly produced into the stipe, the summit broadly and inaequilaterally acuminate and stoutly mucronate, the margin abruptly and narrowly thickened, flat and thin; seeds (mature?) mostly 5–7, situated in the middle line of the legume, 3 mm. long, 2 mm. broad, oval, on very long funicles which stand on thickened bases which are about 3 mm. long.

"A small widely spreading tree. Apolo, 4800 ft. alt., July 2, 1902" (*No. 1508*).

Leucaena boliviana sp. nov.

Puberulent; branches stout, the ends thickened, acuminate, and circinately curved; petioles about 3 cm. long, slender; divisions of the leaf about 5 pairs, 4–6 cm. long, short-petiolulate; leaflets 12–25 pairs, sessile, 5–8 mm. long, 2–3 mm. broad, oblong, very oblique and slightly falcate, the lower side a little more than twice the width of the upper, mucronulate, gray-hairy beneath, the principal secondaries 4 or 5 pairs, with smaller intermediate ones, the lower connecting about 1 mm. from the margin; flowers not seen; stipe of the pod 12 mm. long; pod nearly 15 cm. long, 2.5 cm. broad, abruptly acuminate at both ends, thin, about 10-seeded, constricted between the seeds, which are about 7 mm. in greatest breadth.

"A bush 10 ft. high; San Buena Ventura, 1500 ft., Nov. 29, 1901" (*No. 356*).

Mimosa ixiamensis sp. nov.

Stems sharply angled, purple, thickly prickly, and the younger parts sparsely pilose with reflexed hairs between the prickles; prickles recurved, strongly compressed, short; stipules setaceous, erect; petioles about 2.5 cm. long, prickly like the rachis; divisions of the leaf 5–7, 12–20 mm. long, the rachis bearing several small straight prickles; leaflets numerous, sparsely pilose, 2–3 mm. long, narrowly oblong, slightly broader above, acutish, thickish; peduncles of the heads about 6 mm. long, prickly; heads about 6 mm. long; pods about 15 mm. long, 3 mm. broad, prickly, slightly falcate, mostly 4-seeded.

"Ixiamas, 1500 ft., Dec. 25, 1901" (*No. 269*).

Mimosa Williamsii sp. nov.

Stem beset with coarse, yellow, divergent bristly hairs, those of the leaves closely appressed; prickles numerous, small, recurved, compressed; petioles 10–20 mm. long, very slender, angled,

prickly and bristly; leaves bipinnate, the divisions 4–6 pairs, 2.5–5 cm. long, the rachis prickly and bristly; stipules setaceous, recurved, about 7 mm. long, the stipellae similar, but smaller; leaflets very numerous, 5–7 mm. long, 1–1.5 mm. broad, oblong-lanceolate, the margin yellowish, above minutely strigose, beneath sparsely pilose, the venation obscure; flowers not seen; fruiting peduncles about 12 mm. long, slender, nerved, bristly; pods sessile, 2–2.5 cm. broad, both margins very bristly, mostly 4-jointed, the seed occupying about half of the width of the joint.

"Six ft. high, spreading, the leaves sensitive; San Buena Ventura, 1400 ft., Nov. 15, 1901" (*No. 659*).

CAESALPINIACEAE

Bauhinia calliandroides sp. nov.

(Fruiting specimen.)

Glabrate. Branchlets brownish-gray. Tendrils simple, strongly circinate, when young flat, becoming nearly terete, much thickened and woody with age. Stipules not seen. Petioles 3–7 cm. long, slender, sub-terete, slightly channelled above and striate underneath, thickened at the summit, where the blackish glands are continuous with a small reniform-elliptical gland at the base of each leaflet; between these, and at their summit, on the lower surface, a minute white capitate, bluntly pointed body borne on a stout peduncle. Leaves very thick, shining above, broadly and shallowly cordate, varying from reniform rotund with the leaflets meeting or overlapping at the summit to broader, with the leaflets moderately separated above; leaflets 5–10 cm. long, 2.5–7 cm. broad, the outer curve varying from regularly semi-circular to regularly and broadly semi-ovate, the inner curve varying from nearly straight and shallowly incurved at about the middle to lightly sigmoid, with the greater curve toward the summit; ribs of each leaflet 5 or rarely 6, lightly and irregularly connecting near the margin, slender and sharply prominent beneath with a coarse reticulation of the light secondaries. Fruiting peduncles and rachis very stout, sharply nodose; pedicel stout, 4–6 mm. long, bearing the thickened rim of the calyx. Legume thickish for this genus, 6–8 cm. long, 1–1.5 cm. broad, irregularly oblong, blunt and (at least at first) slightly mucronate, the crenate base passing regularly into a short stipe, a very slender, sharp thickening at both margins, about 4- or 5-seeded.

"San Buena Ventura, 1500 ft. alt., Nov. 25, 1901" (*No. 613*).

Bauhinia Conwayi sp. nov.

Branchlets slender, terete, strongly flexuous, ferruginous-puberulent, becoming tomentose at the inflorescence and especially upon the young legumes, the internodes about 3–6 cm. long. Stipules not seen. Petioles 6–8 mm. long, stoutish, tomentose.

Leaf outline broadly rhomboidally obovate, the base varying from rounded to truncate. Leaflets connate for about one-fourth their length, 7–16 cm. long, from the base, 2–4 cm. broad, the tops of the larger ones about 10 or 12 cm. apart, with a minute, tomentose mucro in the sub-acute, triangulate sinus, lanceolate and sharply acuminate. Leaves thickish, glabrous except at the base underneath and sometimes upon the line of union above, the ribs 7 or rarely 9, sharply prominent beneath, connected by the lightly upcurved secondaries. Raceme shortly and stoutly peduncled, the rachis nodose. Fragments of a single flower seen, its peduncle about 4 or 5 mm. long, very stout, the undivided portion of calyx a little more than 1 cm. long, strongly 10-ribbed, the ribs rounded; calyx-limb separating to the base into 2 or 3 divisions which become spirally twisted and, if straight, would probably be 6–10 cm. in length. Petals not seen. Stamens 10, connate at the tomentose bases, slender, the anthers not seen. Entire pistil about 8 cm. long, the stipe (apparently free from the calyx-tube) about 4 cm. long, the inaequilaterally oblong tomentose ovary about 1.25 cm. long, the remainder being the style. Young pod narrow, thickish, tomentose, slightly broader toward the summit.

"Tumupasa, 1800 ft. alt., Jan. 23, 1902" (*No. 485*).

Bauhinia tumupasensis sp. nov.

Ferruginous-tomentose, with the exception of the glabrous upper leaf-surfaces. Branchlets stoutish, flexuous, the internodes about 6–8 cm. long. Stipules 6–8 mm. long, filiform, abruptly contracted from a broadly ovate base. Petioles 6–10 mm. long, extremely thick. Leaves very thick, obovate in outline, with rounded, lightly cordate base, the tips of the leaflets about 6–8 cm. apart, the ribs 6 or 8, highly channelled above, prominent beneath, connected by the straightish, stout secondaries and these by the mostly vertical numerous tertiaries. Leaflets 8–15 cm. long, 3–6 cm. broad, lance-ovate, at length blunt, connate for about one-third their length, with a very acute sinus, the inner margin very slightly curved except near the summit. Raceme simple, very stoutly peduncled, the pedicels 5 or 6 mm. long, very stout. Bud, just before expanding, about 10 cm. long, obtuse, valvate; unexpanded portion or tube about 1.5 cm. long, infundibular, coarsely ribbed, the remainder dividing into 3 spirally twisted divisions. Petals very narrow and obscure. Stamens 10, unequal, all with anthers, the anthers unequal, the longest 1 cm. long; filaments very slightly connate at the glabrous bases. Ovary-stipe free, about two-thirds the total length of the pistil, the linear, straight, tomentose ovary about 1.5 cm. long, the style slender with oval stigma.

"Three ft. high. Tumupasa, 1800 ft. alt., Dec. 17, 1901" (*No. 495*).

Cassia subelliptica sp. nov.

Glabrate; branchlets green, spreading; stipules 5–6 mm. long, thin, inaequilaterally lance-oblong, acute, caducous; petioles (of upper leaves) 2.5–4 cm. long, the remaining portion 5–10 cm. long; leaflets 3–6 pairs, extremely variable in size, those of the upper leaves 2–4 cm. long, 8–16 mm. broad, the lower reaching 10 cm. long and 4 cm. broad, very shortly petioled, elliptical or more or less oblique at the base, mucronulate, thin, the venation slender and rather inconspicuous, coarsely reticulate, the 8–10 secondaries ascending strongly at the base, then arching outwards; racemes axillary, the peduncles 6–10 cm. long, coarsely angled, the racemes small, short and broad; peduncles 10–15 mm. long, slender; sepals 8 mm. long, elliptical, thin, yellowish; corolla 2.5 cm. broad, deep-yellow, strongly veined; filaments of larger stamens about 5 mm. long, the anthers shorter, stout, strongly curved, the shorter anthers about reaching the base of the larger, on short filaments; pistil about equalling the larger stamens, the style about as long as the pilose falcate ovary, the strongly inflexed stigma shorter, its summit slightly involute; fruit not seen.

"Slender, 8 ft. high; Sorata, 7500 ft., Sept. 1, 1901" (*No. 2383*).

Species related to the preceding, and near *C. birostris* Domb.

Cassia pazensis sp. nov.

Youngest portions lightly pilose, otherwise glabrous; branchlets stout, costate, very leafy or sharply nodose from leaf-scars; stipules 4–6 mm. long, lanceolate, acuminate, with strong mid-rib, deciduous; leaves 4–8 cm. long, the petioles short and stout; leaflets 5–7 pairs, on very short petiolules, the lowest smallest, 8–25 mm. long, 5–10 mm. broad, elliptical, mucronate, pale, thick, with very stout mid-rib, the secondaries very numerous and obscure; racemes terminal, small, few-flowered, the peduncles and pedicels very strongly angled, the pedicels articulated to the rachis, 10–12 mm. long; largest sepals 7 mm. long, 5.5 mm. broad, elliptical, thickish, yellowish-green; flower 2 cm. broad, the petals thickish, deep-yellow, very veiny; longer filaments 3 mm. long, stout, their anthers rather longer, strongly curved; pistil declined, strongly curved, pilose, dark-colored, about 7 mm. long, the stipe and stout style of about equal length; stipe of legume about 8 mm long, stout, the legume 3.5–7 cm. long, 12–18 mm. broad, 6–8 seeded, thick with thickened margins; seed 7 mm. long, a third as broad, obovoid, not, or little compressed, smooth, brown.

"Up to 6 ft. high; La Paz, 11,500 ft., Aug. 21, 1901" (*No. 2344*).

This is the same as *Bang's No. 1985*, and probably *Mandon's 751*. The species is near *C. laevigata*.

GERANIACEAE

Ledocarpon bolivianum sp. nov.

Canescent; stem shrubby, erect, very ramose, the branches short, slender, the leaves densely imbricated on the very short branchlets; leaves opposite, simple, sessile, 2–3 mm. long, oblong, obtuse, thick and fleshy, two-grooved upon the lower surface; flowers solitary at the ends of the branchlets, on slender peduncles 10–15 mm. long; linear bracts of the calyx about 5 mm. long, numerous; sepals 12 mm. long, lanceolate, acuminate, purple, especially beneath, strongly nerved; stamens one-third the length of the petals, the anthers nearly as long as the filaments; petals deep-yellow, 18 mm. long, broadly obovate; ovary white-pilose, the style exceeding the stamens; capsule 6–8 mm. long, strongly nerved.

"Four ft. high; Yura, Peru, 8400 ft., Aug. 10, 1901" (*No. 2561*).

OXALIDACEAE

Oxalis aphylla sp. nov.

Leafless and glabrous; stems 7–10 cm. high, 1–2 flowered, very slender, erect, from a bulb-like base, which is invested by scales; scales 5–8 mm. long, broadly ovate, purplish, bearing three thick purple or red ribs; sepals 3 mm. long, oblong, obtuse, deep violet-purple; corolla 12 mm. long, light-purple; stamens unequal, longer than the calyx.

"Hills near Apolo, 6000 ft., Feb. 20, 1902" (*No. 125*).

Biophytum ferrugineum sp. nov.

Softly pubescent throughout; stems erect or ascending, stout and somewhat woody, 1–3 dm. high, sparingly branched, leafy at the summit; stipules linear, small, caducous; petioles 4–8 mm. long, leaves 5–8 cm. long; leaflets sessile, 11–14 pairs, 6–12 mm. long, 4–5 mm. broad, rhomboidal, slightly broader near the summit, acutish, a slight rounded auricle at the base on the lower side; peduncles fascicled at the summit, 1.5–3 cm. long, erect, strongly pilose with ferruginous, divaricate hairs; bracts linear-setaceous, rigid, strongly pilose; sepals 6 mm. long, lanceolate, attenuate, strongly pilose; petals 8 mm. long, thin, strongly nerved; long stamens 5 mm. long, the short ones half as long; pistil about 1 mm. long, deep-red, the ovary globose, about as long as the stout, subulate spreading styles.

"Guanai, 1500 ft., Sept. 27, 1901" (*No. 711*).

MALPIGHIACEAE

Hiraea strigulosa sp. nov.

Strigose-tomentose; branchlets slender, widely spreading, the internodes 5–7 cm. long; petioles 1.25–2 cm. long, stout; blades

7–12 cm. long, 4–8 cm. broad, ovate, acuminate and acute, rounded at the base, thin, lightly scabrous above, soft-tomentose beneath, the secondaries 5 or 6 pairs, strongly upcurved at the ends, connected by the straightish tertiaries, the venation coarsely reticulate, all strongly prominent beneath; racemes 4–8 cm. long, or longer in fruit, the peduncles 1.5–2 cm. long, stout, loosely flowered; pedicels 8–10 mm. long, linear-bracted at the base, subulate-bracteolate and glandular at about the middle; calyx 5 mm. broad, the 8 glands large; petals 5–6 mm. long, long-clawed, entire; fruit 2–2.5 cm. broad, very thin, the body oblong, 4 mm. long.

"Charopampa, 1600 ft., Sept. 23, 1901" (*No. 799*). *No. 752* from the same locality, Sept. 21, 1901, is the same, in flower. Its leaves are broader and less acuminate.

Tetrapterys elliptica sp. nov.

Glabrous, except the fruit; branchlets ascending, terete, purple; petioles 12–15 mm. long, stout; blades 15–20 cm. long, 7–9 cm. broad, oval, slightly and obtusely pointed, very abruptly contracted into the petiole, coriaceous, slightly shining above, the slender venation very prominent beneath, the 6 pairs of strongly upcurved secondaries connected by numerous slender tertiaries; panicles axillary, very large, loose, the peduncle very short and stout, the rachis dilated at the points of branching, where there are very small, thickish ovate bracts; flowers not seen; pedicels 5–6 mm. long; calyx 6–7 mm. broad, the 8 glands large; largest wing 2 cm. long, 8 mm. broad, smallest 7 mm. long, 5 mm. broad, all strongly and rather coarsely nerved, pubescent, the dorsal crest wing-like.

"Mapiri, 1600 ft., Sept. 17, 1901" (*No. 777*).

Banisteriopsis sublucida sp. nov.

Lower leaf-surfaces lightly pilose, inflorescence puberulent, otherwise glabrous; branchlets short, stout, purple; petioles about 6 mm. long, margined; blades 7–10 cm. long, 3–4 cm. broad, oval, very short-pointed, thick, shining above, grayish beneath, the 5 or 6 pairs of secondaries strongly ascending, strongly prominent beneath, the venation coarsely reticulate, the petiolar glands not apparent; panicles lateral, small, short-peduncled, the flowers racemed on the short nodose branches; pedicels slender, 6–12 mm. long, bracteolate at the base; calyx 8-glandular, the glands white; sepals 2–3 mm. long, oblong, yellowish; petals yellow, 6 mm. long, long-clawed, sub-rotund, fimbriate; samara about 3 cm. long, 1 cm. broad, the sides of the body cristate or sub-alate.

"A large spreading bush or small tree; Apolo, 4800 ft., Feb. 24, 1902" (*No. 102*).

Resembles *B. lucida*. A very unusual type of *Banisteriopsis* in habit, in inflorescence and in its wing-like, lateral fruit-crests.

Banisteriopsis illustris sp. nov.

Sericeous, or the upper leaf-surfaces tomentellate; stems erect, divaricately branched, the branches purple, glabrate; stipular glands small, obscure, depressed; petioles 6 mm. long, broad; blades 2–7 cm. long, 2–6 cm. broad, ovate, abruptly short-acuminate and acute, slightly produced into the petiole, green or brownish above, white-silky beneath; principal secondaries mostly 3 pairs, strongly ascending, prominent beneath; panicles large, compound, lax, peduncled; bracts very small, ovate, acuminate, caducous; pedicels mostly about 8–10 mm. long, slender, minutely 2-bracteolate near the base; sepals broadly ovate, acute, nearly equalling the bud, about 2 mm. long, the glands two-thirds their length, oblong; petals light purple, short-clawed, about 6 mm. long, obovate, erose-dentate; longer stamens exceeding the sepals; samara 2.5–3 cm. long, and nearly half as broad, the base white, the wing purple, sericeous, thin, the margin little thickened, finely many-nerved, the nerves regularly arching outward; tubercles small, rather sharp.

"A bush, 7 ft. high; Apolo, 4800 ft., Mar. 9, 1902" (*No. 62*). *No. 192*, from the same locality, Apr. 15, 1902, of which Mr. Williams says, "A stout vine-like bush," is the same, as is *No. 165* from the same locality, Apr. 16, 1902, of which Mr. Williams says, "A stout vine, trailing over bushes."

Rusby's No. 511, and *Bang's No. 1365*, are probably the same.

The species is near *B. argentea* A. Juss.

Banisteriopsis Williamsii sp. nov.

Lower leaf-surfaces and inflorescence puberulent; branches slender, purple, widely branched, the branches recurved; petioles about 6 mm. long, bi-glandular near the summit; blades 6–8 cm. long, 3–4 cm. wide, oval, abruptly short-acuminate, mucronate or aristate at the apex, rounded at the base, thick, the secondaries about 6–8 pairs, diverging at an angle of about 45 degrees and lightly ascending, prominent underneath, the venation slender, coarsely reticulate; calyx lobes small, triangular-lanceolate; samara immature in my specimen, oblanceolate, nearly straight, purple, thin, the body white, sharply tuberculate.

"Very slender, 15 ft. high; Mapiri, 1600 ft., Sept. 15, 1901" (*No. 809*). A part of *No. 484* from Tumupasa, 1800 ft., Jan. 14, 1902, is the same. The other portion of my specimen is another species of *Banisteriopsis*, probably undescribed, but too young for positive determination.

The species above described is well distinguished by its mucronate-aristate leaves.

Dicella Conwayi sp. nov.

Glabrous, in fruiting state; petioles about 12 mm. long, weak and mostly twisted; blades 4–8 cm. long, 2–4 cm. broad, oval, abruptly contracted into the petiole, shining above, drying brown underneath, the secondaries 5–6 pairs, strongly ascending, the venation slender, finely reticulate, lightly prominent above, strongly so underneath; panicles axillary and terminal, long-peduncled, loose; bracts small, ovate, mostly twisted; pedicels in fruit 6–12 mm. long, thickened toward the summit; calyx strigose at the base, the glands 8, oblong, the upper portion free, 2–3 mm. long; sepals short-clawed, oblong or slightly oblanceolate, rounded at the summit, the smallest 12–15 mm. long and 5–6 mm. broad, the largest 3–4 cm. long, 15–20 mm. broad, the venation strong and prominent on both sides; fruit brown, reticulate, depressed-globose, 12 mm. broad, 5-ribbed, the ribs very unequal in prominence, tipped by the small, stout, purple, recurved styles, the wall thick and woody.

"A slender bush; Charopampa, 1600 ft., Sept. 9, 1901" (*No. 766*).

Rutaceae

Esenbeckia lucida sp. nov.

Glabrous; branchlets stout, white, leafy; petioles 8–12 mm. long, stout; blades 7–12 cm. long, 4–6 cm. wide, ovate or oval, very shortly acuminate at both ends, obtuse, thickish, pale and slightly shining, the slender, crooked venation lightly prominent above, strongly so beneath, very coarsely reticulate, the secondaries 6 or 8 pairs, spreading at a wide angle, then upcurved; peduncles about 18 mm. long, stout, angled; cymes, in fruit, 4–8 cm. broad, mostly 3-branched, loose; pedicels short and extremely thick, sharply angled or costate; calyx cupulate-campanulate, 2 mm. long and almost as broad, 5-angled, thick, truncate or minutely 5-toothed, in fruit somewhat enlarged and irregularly 5-lobed; fruit 5–6 mm. high, about twice as broad, strongly 5-lobed, black, densely and coarsely papillose.

"A bush, 10 ft. high; Rio San Juan, 3500 ft., Apr. 5, 1902" (*No. 252*).

Cusparia pilocarpoidia sp. nov.

Glabrous; branches slender, whitish, leafy at the ends, the leaves irregularly disposed, 1-foliolate; petioles 10–15 mm. long, slender; blades 10–20 cm. long, 2.5–4 cm. wide, oblanceolate, lightly retuse or acute, thin, the midrib lightly impressed above, the venation otherwise lightly prominent on both sides, the slender secondaries numerous; inflorescence irregularly panicled, the panicle short, loose, branching from the base, the branches long-peduncled; flowers not seen; fruiting carpels solitary, sessile, the aborted vestiges of 3–5 others at the base; calyx very short,

sinuately lobed; fruit 10–12 mm. long and broad; seed 5 mm. long, 3 mm. broad, reniform, smooth, partly enclosed in the 2-lobed, light-yellow endocarp.

"A slender bush; San Rafael, 2000 ft., March 27, 1902" (*No. 223*).

Meliaceae

Cedrela brunellioides sp. nov.

Glabrous. Leaves (but two seen) 25 cm. long, the petiole about one-third as long as the rachis, stout; leaflets 17, the petiolules 4 or 5 mm. long, the blades 7 to 10 cm. long, 3 to 5 cm. broad, lance-oblong, rounded at the base, abruptly short-acuminate and acute, obscurely crenate with the minutely projecting point of a secondary in each sinus, coriaceous, shining above, dull and paler underneath, where the midrib and 18 to 25 pairs of slender secondaries are prominent. Fruit 7 cm. long, ovoid, the pericarp thick and woody. Seed brown, nearly 2 cm. long and about half as broad, the base acute, the wing exceeding it by 3 cm., 12 mm. broad, oblanceolate, inaequilateral, the summit rounded, the outer margin thickened.

"Tree 15 inches in diameter and 45 ft. high, called "Cedro." Santa Barbara, 5000 ft. alt., Aug. 30, 1902" (*No. 1558*).

Vochysiaceae

Qualea virgata sp. nov.

Puberulent; branchlets slender, lightly recurved, purple; stipular glands depressed, purple with whitish central point, 1–1.5 mm. long, oblong or circular; petioles 3 mm. long, very thick; blades 4–8 cm. long, 2–4 cm. broad, oval, acute, minutely cordate, lightly sinuate-margined, thick, pale ferruginous beneath, slightly scabrous above, the midrib narrowly channelled above, the numerous secondaries lightly upcurved and meeting to form a thickish margin, the venation prominent beneath; panicles terminal, peduncled, narrow, dense above; pedicels unequal, slender, mostly about 6 mm. long, glandular-bracted at the base, the glands mostly a little elevated; lateral sepals broadly ovate, obtuse, 5–6 mm. long, the posterior very slightly gibbous; petal reaching 2.5 cm. long, clawed, very broad, obcordate, the margin erose, yellow with the middle portion purple-striped; stamen 15 mm. long, straight, the anther 5 mm. long, ovoid; style coiled, when straightened, about equalling the stamens.

"A low round-topped tree, with trunk 12 inches in diameter and gray scaley bark; Tumupasa, 2000 ft., Dec. 16, 1901" (*No. 415*).

Euphorbiaceae

Amanoa muricata sp. nov.

Glabrous, the branchlets slender, erect, spreading, leafy; stipules 6 mm. long, linear, attenuate, thick; petioles 6–12 mm. long, very slender; blades 4–7 cm. long, 2–3 cm. broad, lance-oblong, acute at the base, the summit abruptly contracted into a narrow, obtuse acumination, entire, the venation slender, obscure, lightly prominent underneath; peduncle 3 mm. long, very stout, thickened upward; fruits 2 or 3, sub-sessile, 8–10 mm. long, globoidal, clothed toward the summit with few large, bract-like acuminate murications.

"A slender bush 8 feet high; San Juan, 3200 ft., March 20, 1902" (*No. 213*).

Phyllanthus cassioides sp. nov.

Glabrate; plant about 5 dm. high, the branches elongated, slender, weak, irregularly ascending, the branchlets 5–7 cm. long, very slender, spreading, very leafy, except the flowering ones, which are about 2 mm. long, very slender, one-flowered and densely clothed below with minute subulate bracts; leaves nearly sessile, 5–10 mm. long, inaequilaterally oblong, acute, oblique at the base, thin, pale or glaucous underneath, where the six pairs of thin secondaries are sharply prominent; flower very slenderly pedicelled, 2 mm. broad; sepals oval, thin; stamens 3, distinct, about half as long as the sepals, the anthers erect, broader than long, each theca sub-globose.

"Isapuri, 1500 ft., Sept. 30, 1901" (*No. 747*). Species near *P. lathyroides*.

Croton Williamsii (Sect. Eucroton) sp. nov.

Shortly and densely gray-tomentose throughout, the branches elongated and slender; stipules 3 mm. long, attenuate from the base; petioles 12–30 mm. long, slender, sharply channelled above; blades 2–4 cm. long, 15–40 mm. wide, ovate or lance-ovate, rounded at the base, long-acuminate, entire, brown above, gray underneath, the venation lightly prominent both sides, especially underneath, the secondaries 8 or 10 on each side, conspicuously interarching near the margin, the fine venation loosely reticulate; glands two at junction of petiole with blade, nearly 1 mm. broad, cup-shaped, becoming black; spikes short-peduncled, 7–12 cm. long, slender, rather distantly flowered; flowers very shortly pedicelled; buds globose, 2 mm. broad; flower 5 mm. broad; sepals oval, obtuse, veiny; petals (of the staminate flowers) about equalling the sepals but narrower, oblong, the summit lacerate; stamens about equalling the perianth, the filaments stoutish, the anthers short, oval; capsule 4 mm. long.

"A shrub, 4 or 5 ft. high; San Juan, 3200 ft., March 22, 1902" (*No. 210*).

Species near *C. echioides*.

Acalypha alchorneoides sp. nov.

Glabrous, except for a sparse and minute pubescence on the very young portions. Branchlets elongated, slender, deep-red. Stipules about 6 mm. long, tapering regularly from a broad, partly clasping base. Petioles slender, 6–12 mm. long; blades 6–12 cm. long, 2.5–5 cm. broad, lanceolate with rounded base and long-acuminate summit, finely crenate, thin, deep-green, the secondaries 6–8 on a side, strongly upcurved and connected by the straight tertiaries, the venation impressed on the upper surface, sharply prominent underneath. Spikes 6 cm. long or shorter, 2 mm. thick, nearly sessile, one or two pistillate flowers at the base; staminate flowers densely crowded, minute, very shortly pedicellate, their bracts scarcely perceptible; anther-sacs nearly globose; styles stout, about a half longer than the ovary, not including their moderately fimbriate appendages, the ovary and styles coarsely pilose. Mature fruit rough-pilose, 2–3 mm. broad and a little more than half as long, strongly 3-lobed, tipped by the stout, erect styles, which are a little more than half as long as the capsule; persistent calyx lobes narrowly triangulate, acutish, with broad sinuses, closely appressed to the capsule and mostly a little more than half its length.

"A slender shrub. San Buena Ventura, 1400 ft. alt., Nov. 12, 1901" (*No. 674*).

Acalypha Williamsii sp. nov.

Leaves and inflorescence minutely puberulent; branches elongated, slender, angled, reddish; stipules 8 mm. long, ovate, acuminate; petioles 7–10 cm. long, slender; blades 15–20 cm. long, 10–15 cm. broad, ovate, sub-cordate, abruptly short-acuminate, crenate-serrate, very thin, 5-costate, with about 10 additional pairs of slender, ascending secondaries; spikes 20–25 cm. long, short-peduncled, slender, densely flowered, the flowering portion 8 mm. broad; bracts short-stipitate, inaequilateral, 6 mm. long, 9 mm. broad, truncate, the margin shortly and sharply toothed; styles exceeding the bracts; capsules shorter than the bracts and concealed by them.

"A stout bush, 15 ft. high, San Buena Ventura, 1500 ft., Nov. 20, 1901" (*No. 656*).

The same as *Rusby's 1269*, heretofore referred doubtfully to *A. macrostachya* Jacq. Also collected by Burchell. Very near *J. D. Smith's 5487*.

Chaetocarpus Pearcei sp. nov.

Glabrous; branchlets short, stout, leafy; petioles 6–7 mm. long, very stout; blades 5–10 cm. long, 2.5–5 cm. broad, oval, slightly inaequilateral, acute, very abruptly contracted into the petiole, entire, thick, shining above, brown underneath; principal secondaries about 7 on each side, irregularly connected toward the margin, the fine venation loosely and irregularly reticulate, prominent on both surfaces; fruit sub-globose, 12 mm. long, deep-brown, shortly and stoutly scaly-muricate, 4-valved.

"A low tree, near Inglis-Inglis, 6000 ft., Aug. 8, 1902" (*No. 1576*).

The same species was collected by Pearce at Moro, 5000–6000 ft., Jan. 1866, in flower, and near Santa Cruz, 7000 ft., Feb. 1865, in fruit. From these specimens the following description is taken.

Flowers in dense axillary clusters; pedicels 6 mm. or more in length, pubescent, like the calyx, the latter parted two-thirds of its length, the lobes 2 mm. long and broad, oval; stamens nearly 4 mm. long, the filaments tapering, reddish-pilose, the anthers short and broad. Styles about 2.5 mm. long, subulate, densely reddish pilose; fruiting peduncles 6 mm. long.

Anacardiaceae

Schinus tomentosa sp. nov.

Ferruginous-pilose, the hairs spreading or divergent; branchlets short and stout; uppermost leaves only seen, the petioles 1.25 cm. long, very stout, the longest rachis 4 cm. long; leaflets 3–5, the petioles 3 mm. long, very stout, the blades 4–8 cm. long, 2.5–4 cm. broad, ovate, rounded or sub-truncate at the base, blunt, thick, above pale, softly tomentose, the midrib and 8–10 pairs of secondaries lightly impressed, beneath ferruginous with the venation very prominent; panicles crowded, very unequal, sub-sessile, the branchlets densely fruited; bracts inconspicuous; flowers not seen; fruits sub-sessile, the calyx 4 mm. broad, the fruit inaequilaterally oval, 6 mm. long, 5 mm. broad, tipped with the small stigma, purple, sparsely tomentellate.

"A shrub 7 ft. high; Apolo, 4800 ft., Sept. 7, 1902" (*No. 1603*).

Schinus maurioides sp. nov.

Glabrous; branchlets purple, ascending, leafy; petioles 4–5 cm. long, slender, nearly terete; leaflets 5–9, the internodes of the rachis 18–40 mm. long; petiolules 3–4 mm. long, the blades 6–10 cm. long, 2.5–4 cm. broad, lanceolate, rounded at the base, abruptly short-acuminate and obtuse, entire, coriaceous, pale-green and slightly shining above, the venation very slender, coarsely reticulate, lightly prominent on both sides; panicles axillary and terminal, rather small and loose, peduncled; flowers not seen; pedicels of

the (mature?) fruits 1.5 mm. long, the bracts of the inflorescence 1 mm. long, triangular-ovate; calyx persistent, shallowly and broadly lobed, 2 mm. broad; fruit 6 mm. long, 5 mm. broad, obliquely oval, tipped by the very small stigma, purple.

"A low bush with red fruit; Apolo, Mar. 6, 1902" (*No. 35*).

Rhamnaceae

Gouania ursinicarpa sp. nov.

Densely pubescent, more or less ferruginous; branches and branchlets slender, widely spreading, purple; tendrils about 5 cm. long if unrolled, very strongly thickened above and then tapering, pubescent throughout; petioles 6–12 mm. long, rather slender; blades 6–8 cm. long, 3.5–5 cm. broad, ovate, cordate at the base, shortly acuminate, serrate with abrupt, small, obtusish, salient teeth, the secondaries 5–8 pairs, the lowermost emitting 2 or 3 strong basal branches, connecting near the margin and throwing a stout branchlet into each tooth, connected by stout, straightish branches, all strongly prominent underneath; spikes simple or paniculate, elongated, slender; fruits 5 mm. long and broad, the wings narrow and obtusish, densely ferruginous-pilose; seeds dark-brown, smooth, shining, ovoid, obtuse, 3 mm. long, 2 mm. broad.

"Mapiri, 1600 ft., Sept. 24, 1901" (*No. 715*).

Ochnaceae

Ouratea oblongifolia sp. nov.

Glabrous; branchlets elongated, slender; stipules 5 mm. long, rigid, acuminate from the base, very acute, sharply nerved or costate; petioles 4 mm. long, very broad; blades 5–8 cm. long, 5–7 cm. broad, oblong-oblanceolate, more or less rotund at the base, abruptly very short acuminate, serrate with very fine and sharp erect teeth, coriaceous, the secondaries about 10 pairs, crowded at the base, very strongly ascending and connecting almost at the edge, connected by the sub-pectinate tertiaries, all sharply prominent above; raceme simple, elongated, stout; pedicels 8 mm. long, stout, angled; fruiting disk very irregular, black, like the fruit, about 7 mm. broad; drupe regularly elliptical, lightly shining, finely nerved, 8 mm. long.

"5 ft. high, San Buena Ventura, 1500 ft." (*No. 371*).

Marcgraviaceae

Souroubea brachystachya sp. nov.

Glabrous; branches stout, the bark whitish; petioles 4–6 mm. long, very stout; leaves very thick, eglandular, 7–12 cm. long, 4–5 cm. broad, obovate, obtuse at the base, rounded and minutely retuse at the summit, the margin thinly revolute; racemes terminal, simple, about 5 cm. long; pedicels 8–12 mm. long, stout, erect or

incurved; bract placed at the base of the flower, the basal expanded portion consisting of two broadly ovate obtuse lateral lobes, each about 4 mm. long, the spur 10 mm. long, lightly curved, clavate; bud globose, 5 or 6 mm. broad; anthers very small, short and broad.

"Stems 3 inches in diameter and 30 to 40 ft. long; near Atten, 6000 ft., Aug. 8, 1902" (*No. 1461*).

Species near *S. bicolor* (Benth.).

Theaceae

Taonabo subserrata sp. nov.

Glabrous, except for the minutely papillose sepals. Branchlets numerous, short, stout, grayish-red, roughened with very narrow annulae and transverse fissures. Leaves drying dark-brown, crowded, the petioles 3 or 4 mm. long and nearly as broad, the blades 4–7 cm. long, 2–3 cm. broad, a little broader above, the base abruptly short-acuminate, the summit obscurely so, obtuse or minutely retuse, the margin thinly recurved, obscurely serrate, the midrib faintly impressed above, coarsely prominent underneath, where the slender venation is slightly prominent and coarsely reticulate. Flowers rather abundant, the peduncles 1–1.5 cm. long, stout, blackish. Calyx 1–1.25 cm. broad, the sepals fleshy, papillose-ciliate. Corolla nearly a half broader than the calyx; stamens very numerous, linear, about 1.5 mm. long. Style stout, shorter than the stamens.

"A stout shrub, 7 ft. high, Cargadira, 8000 ft. alt., July 30, 1902" (*No. 1533*).

Taonabo flavifolia sp. nov.

(Fruiting specimen.)

Glabrous throughout, the branchlets stout, reddish-gray, becoming gray with age. Leaves 3–9 cm. long, 1–3 cm. broad, oblanceolate, tapering gradually into a petiole-like base, obtuse, drying yellowish-green, with entire revolute margins, thick and coriaceous, the midrib narrowly impressed above, sharply prominent beneath, the venation very slender, the principal secondaries 10–12 on each side, obscure, interarching. Fruits sparse, globose, about 1 cm. broad, light-brown, the persistent style blackish, about 2 mm. long; peduncle slender, nearly as long as the fruit, the persistent sepals appressed, unequal, the largest reaching nearly to the middle of the fruit; seeds light-brown, smooth, nearly ellipsoidal, slightly curved, about 6 mm. long, 4.5 mm. broad.

"A tree 20 ft. high and 6 in. in diameter, Aten, 5000 ft. alt., Aug. 17, 1902" (*No. 1452*).

GUTTIFERAE

Caopia cordata sp. nov.

Shortly ferruginous-tomentose, except the glabrous upper leaf-surfaces; branchlets elongated, slender, coarsely angled; stipules very small, ovate, obtuse; petioles 15–25 mm. long, very stout, channelled above; blades 12–17 cm. long, 6–10 cm. broad, ovate, cordate, acute, entire, thick, the midrib and 15–20 pairs of secondaries strongly prominent underneath, mostly finely channelled on the upper surface, the crooked coarsely and irregularly reticulate fine venation lightly prominent above; peduncle terminal, 2.5 cm. long, the panicle few and loosely fruited; pedicels about 5 mm. long, stout; calyx lobes unequal, a little longer than the pedicels, oblong, strongly reflexed; fruit 13–15 mm. long, broadly ovoid with rounded summit, deep red, finely sparsely tomentose, surmounted by the slender styles.

"A bush 10 ft. high; Apolo, Feb. 23, 1902" (*No. 99*).

The species is near to *C. macrophylla* (H.B.K.), but differs in its hirsute midrib, and broad leaves.

It appears to be the same as a specimen collected by Pearce.

Clusia Lechleri (Sect. Criuva) sp. nov.

Glabrous; branchlets robust; petioles about 8 mm. long, very broad, margined; blades 6–12 cm. long, 3–7 cm. wide, obovate with cuneate base and rounded summit, very thick, the margin strongly revolute; midrib very prominent underneath; secondaries about 30–35 pairs, ascending at an angle of about 45°, nearly straight; flowers few, terminal; larger petals about 8 mm. long, very broad, concave; stamens numerous, nearly distinct at the base, about 6 mm. long, the reddish filaments about one-third as long as the anthers; fruit shortly and stoutly peduncled, the fruiting calyx 10 mm. broad, the fruit 15 mm. long, broadly obovoid, crowned with 5 thick obovate red stigmas about 3 mm. long, tardily 5-dehiscent; seeds linear-oblong, 6 mm. long, blackish.

"A dioecious tree 10 inches in diameter and 30 ft. high; Apolo, 4800 ft., April 20, 1902" (*No. 2457*).

Apparently the same as *Lechler's No. 2204*, collected at San Agavan, Peru.

Clusia elongata sp. nov.

Glabrous; leaves 10–20 cm. long, 3–6 cm. broad, oblanceolate with rounded summit, tapering regularly from near the summit to the clasping base, without true petiole, moderately thick, the midrib narrowly channelled above, prominent beneath; secondaries very numerous, many branching at the base, ascending at an angle of about 45° and meeting to form a strong, thick line 1–2 mm. from the edge; pistillate cyme few-flowered, the recurved stout peduncle

2–3 cm. long; pedicels in fruit very stout, 6–8 mm. long; fruiting calyx 12 mm. broad; fruit oval, about 2.5 cm. long, inclusive of the styles, 12–18 mm. broad, the 7–8 carpels terminating in more or less spreading, beaklike styles which are 8 mm. long; stigmas large, red, abruptly inflexed.

"Five inches in diameter and 20 ft. high; near Santa Barbara, 6500 ft., Aug. 30, 1902" (*No. 1553*).

The same as *Spruce's No. 4463*.

Frankeniaceae

Frankenia lignosa sp. nov.

A prostrate, much branched shrub, the branches stout, densely leafy, gray-puberulent throughout; leaves 3–5 mm. long, broadly oval-elliptical, but appearing narrow by the strong revolution of the margins, obtuse, thick; flowers apparently cymose, but each terminating a minute branchlet; sepals 8 mm. long, thick, erect and slightly recurved above, rigid, attenuate; petals 12 mm. long, the lower half thick, angled, erect and connivent to simulate a corolla tube, the upper half spreading, thin, white, obovate, with lacerate-toothed margin; stamens shorter than the petals, the filaments petaloid-dilated toward the base, the anthers about 1.5 mm. long, broadly oval; style about equalling the stamens, stout, the stigmas linear, tapering, small.

"Mollendo, Aug. 5, 1901" (*No. 2531*).

Violaceae

Rinorea gracilis sp. nov.

Glabrous, excepting the sparsely ferruginous tomentellate ends of the branchlets, stipules and young petioles; branches much and widely branched, slender, whitish, very leafy; stipules 1.5 mm. long, ovate, acuminate; petioles 3–5 mm. long, rather slender; blades 4–8 cm. long, 15–30 mm. broad, oblanceolate or obovate, cuneate at the base, abruptly short-acuminate, obsoletely serrate, deep-green, thin, the secondaries 6–8 on a side, strongly up-curved, the venation thin, sharp, prominent on both sides, connecting the secondaries with one another; capsule solitary, 15–18 mm. long, on a stout peduncle 6 mm. long, brown, reticulate, ovoid, shortly beaked.

"A slender bush, 7 ft. high; San Buena Ventura, 1500 ft., Nov. 24, 1901" (*No. 611*).

The same collected by Spruce at Tarapota.

Rinorea sp. (?)

Branchlets whitish, the younger portions sparsely puberulent; petioles 8–15 mm. long, slender; blades 10–20 cm. long, 3–9 cm. broad, obovate, cuneate, abruptly contracted into an acute

acumination 8–25 mm. long, obsoletely coarse-serrate, dark-green, thin, the secondaries 10–12 on a side, the venation thin, coarsely reticulate, lightly prominent on both sides; fruiting peduncle 1.5 cm. long, stout, thickened upward, the solitary fruit 3 cm. long, shortly-rostrate, strongly reticulate.

"A tree 25 ft. high, 6 inches in diameter; San Buena Ventura, 1400 ft., Nov. 30, 1901" (*No. 622*).

The trunk has a soft, whitish, thinly scaly bark.

Passifloraceae

Passiflora cayaponioides sp. nov.

(Fruiting specimen.)

Glabrous except for the tomentose fruits, and a sparse, fine puberulence on the petioles, etc. Stems reddish, finely longitudinally wrinkled. Tendrils simple, very slender. Petioles 1.25–2.5 cm. long, stout, bearing two oblong, concave glands near the base; blades 6–12 cm. long, 3–8 cm. broad, triangular-ovate, with truncate or sub-truncate base and short-acuminate and acutish summit and one large, broadly triangular, acute tooth near the middle of each side, 3-ribbed, a rib terminating in each tooth, thin, the slender venation rather coarsely reticulate, prominent on both sides. Inflorescence elongated, loosely racemose, bearing small leaves, the flowers solitary or 2 together. Pedicels twisted, 8–12 mm. long, the stipe 2 or 3 mm. long. Fruit globose (as pressed), 2 cm. broad, ferruginous-tomentose. Seeds 3 or 4 mm. long, regularly ovoid, deeply transversely 3- to 4-sulcate.

"Tumupasa, 1800 ft. alt., Jan. 28, 1902" (*No. 432*).

Caricaceae

Jacaratia boliviana sp. nov.

Glabrate, the branchlets stout, strongly upcurved, somewhat fleshy, gray, bearing conspicuous whitish leaf-scars, the leaves clustered at the summit. Petioles 5–15 cm. long, slender, bearing few very small, soft, yellowish-brown prickles upon and about their bases. Leaves nearly orbicular in outline, of 5–7 (or more?) leaflets, which are borne on petiolules 3–8 mm. long. Blades of the leaflets 5–12 cm. long, 3–5 cm. wide, oblong-lanceolate, abruptly short-pointed, acute at the base, entire or obscurely acuminate, thin, dark-green, the very thin secondaries 6–8 on a side, the venation inconspicuous. Panicles solitary in the axils, narrow, shorter than the leaves, long-peduncled. Flowers (only the staminate seen) sessile, the calyx 1–1.5 mm. broad, parted to below the middle, the lobes semicircular-ovate, with rounded summit, the corolla-tube 8–12 mm. long, narrowed a little above the middle, the limb 12–18 mm. broad, the lobes shaped like the leaflets. Anthers almost wholly external to the tube, the longest nearly 5 mm. long.

"A tree 15 inches in diameter, with corky spikes nearly 1 inch high. Charopampa, 1600 ft. alt., Sept. 22, 1901" (*No. 739*).

BEGONIACEAE

Begonia andina sp. nov.

Ferruginous-tomentose; branches reddish, slender, erect; stipules 2–3 mm. long, red, ovate, attenuate; petioles 2.5–4 cm. long, slender, recurved; blades 5–8 cm. long, 2.5–4 cm. broad, ovate, very inaequilateral, lightly cordate, abruptly very short-acuminate, the margin lightly sinuate, 4–7-nerved, the principal nerve throwing off a pair of strong branches, the venation prominent on both sides, sharply so above; panicles peduncled, widely and loosely branched, broader than long; pedicels (pistillate flower only seen) 5–7 mm. long, slender; flowers 7–9 mm. long; longest perianth-segments 6–7 mm. long, the shortest 4–5 mm. long, ovate; fruit 8 mm. long, 16 mm. broad, the largest wing 8 mm. broad, the opposite one 1.5 mm., strongly reticulate; upper margin of larger wing about on a level with the base of the styles, the lower margin curving about 3 mm. lower than the base of the carpels, its curve sub-regular; fruit crowned with the 3 persistent styles, which are bifid nearly to the base, the divisions bearing 2–5 branches, which are linear and enlarged and papillose at the ends; placentae 4 mm. long, bifid, oblong. Staminate flowers not seen.

"Four feet high, the flowers white; Santa Barbara, 5500 ft.; Aug. 30, 1902" (*No. 1566*).

The same collected by Spruce on Mt. Chimborazo, June, 1860.

MYRTACEAE

Myrtus mapirensis sp. nov.

Glabrous; branchlets short, gray; petioles 3 mm. long, margined; blades 5–7 cm. long, 18–35 mm. broad, rhomboid-ovate, abruptly short-acuminate, obtuse, short-cuneate at the base, thick, with revolute margin, pale, the midrib impressed above, the secondaries numerous, forming a strong line close to the margin; cymes terminal, mostly 3-flowered, the very short peduncle clothed with thick, ovate, imbricated bracts, the pedicels 12–18 mm. long, slender; young fruit depressed-globose or broadly urceolate, the calyx-tube slightly prolonged beyond the ovary, the ovate lobes about as long as the tube, sub-foliaceous, incurved.

"A large tree; Mapiri, 1600 ft., Sept. 23, 1901" (*No. 801*).

Eugenia marlierioides sp. nov.

Glabrous; branches whitish, slender, much branched, the branchlets diverging; petioles 3 mm. long; blades 4–5 cm. long, 12–18 mm. broad, lanceolate, acuminate, obtuse at the base, the venation very slender, little prominent on both sides; fascicles

axillary and terminal, loose, mostly 5–8-flowered; pedicels slender, 8–12 mm. long, minutely subulate-bracted at the base; buds 3–4 mm. broad, the summit sub-truncate; calyx granular externally, the tube turbinate at the base, shorter than the lobes, which are semi-circular and minutely ciliate, one pair about a half larger than the others; petals slightly longer than the sepals.

"A slender bush; San Juan, 3200 ft., Mar. 22, 1902" (*No. 218*).

COMBRETACEAE

Sparattanthelium Burchellii sp. nov.

Branchlets thick, flexuous, ascending, the younger portions finely scabrous, the lower leaf-surfaces ferruginous-tomentellate; petioles 12–25 mm. long, rather slender; blades at maturity 10–15 cm. long, 6–10 cm. broad, elliptical-oval, above finely scabrous, underneath tomentellate, the midrib and about 4 pairs of strongly ascending secondaries very prominent, the secondaries connected by the few straightish tertiaries; leaves when young drying blackish, pilose on the veins above; panicle very broad and lax, the branches very flexuous, white-crusted, like the fruit, which is sessile or shortly and thickly pedicelled, ovoid, 6–8 mm. long, mostly tipped with the small blackish styles, broadly ribbed.

"A shrub 15 feet high; San Buena Ventura, 1400 ft., Nov. 13, 1901" (*No. 644*).

This is the same as the fruiting specimen of *Burchell's No. 8512*. I am not sure that his flowering specimen is of the same species.

ONAGRACEAE

Jussieua marginata sp. nov.

Pubescent throughout, the white hairs divergent; stem, branches and midribs deep-purple; stems erect, stout, sulcate, densely leafy; petioles extremely short, broad; blades 4–6 cm. long, 18–30 mm. broad, ovate, obtuse, rounded or truncate at the base, entire, slightly revolute, thick; principal secondaries about 12 pairs, with intermediate shorter ones, very strong, prominent on both sides, strongly falcate, uniting in a strong multiple marginal line; inflorescence paniculate; pedicels slender, spreading, 1–1.5 cm. long in flower; calyx-tube long-turbinate, 5 mm. long, the lobes 8 mm. long, 4 mm. wide, ovate, abruptly short-acuminate, purple and reflexed in fruit; petals 12 mm. long and broad, very shortly clawed, very veiny; mature fruit not seen; when young bearing 8 strongly white pilose lines radiating from the base of the style to the calyx.

"Six ft. high; Apolo, March 2, 1902" (*No. 21*).

This is the same as *Rusby's No. 1221*. The species is near *J. peruviana*.

Jussieua ferruginea sp. nov.

Ferruginous-pilose throughout, the hairs coarse, rigid, spreading; branches purple, short, loosely spreading, angled; petioles 3 mm. long, slender; blades 1.5–3 cm. long, 10–20 mm. broad, oval-ovate, abruptly contracted into a short acute acumination at each end, entire, thin, the secondaries about 10–14 pairs, the venation rather obscure; peduncles exceedingly short; calyx-tube (in flower) about 8 mm. long, oblanceolate, the lobes 4–5 mm. long, lanceolate, acuminate; petals very thin, little exceeding the calyx; stamens apparently 16, half the length of the petals, the anthers short and broad; capsule 3 cm. long, linear, lightly 16-costate, crowned by the green spreading calyx-lobes.

"Mapira, 1600 ft., Sept. 17, 1901" (*No. 807*). The same as *Appun's No. 268* and *Rusby's No. 1793*. Species near *J. affinis*.

Oenothera rubida sp. nov.

Gray-puberulent, the upper portions white-pilose, the stems, capsules and lower leaf-surfaces bright red-purple; stems simple, erect, terete; leaves 2–4 cm. long, 3–6 mm. broad, lanceolate, acuminate, tapering into a short petiole, unequally and sharply serrate-dentate, thick, the venation inconspicuous; flowers sessile, 2.5–3 cm. long, the lanceolate acuminate calyx-lobes about one-third the length of the tube and two-thirds to three-fourths the length of the petals; filaments broad, nearly as long as the petals, the anthers linear, 5 mm. long; style stout, as long as the filaments; stigmas 2.5 mm. long, oblong; capsule 18 mm. long, 5 mm. broad, lance-oblong, coarsely ribbed, the apices of the valves recurved; seeds small, unequal, oval, black.

"Arequipa, Peru, 7500 ft., Aug. 8, 1901" (*No. 2524*).

Halorrhagidaceae

Myriophyllum pallidum sp. nov.

Stems elongated, rather stout, yellow, the internodes about 5 cm. long. Leaves blue-green, verticillate, mostly in 4's, sessile, the bases dilated and connected, pectinate, the lobes 5–20 pairs, narrowly linear, the longest 15–20 mm. long, drying channelled on the upper surface, the midrib rather conspicuous beneath, obtuse. Dissection material wanting.

Species differs conspicuously from *M. Titicacense*, its closest ally, in its shorter foliage, of bluish-green or glaucous appearance.

"Fed to cattle at Chilalaya, Lake Titicaca, 12540 ft. alt., Oct. 6, 1902" (*No. 887*).

Ericaceae

Befaria parvifolia sp. nov.

A low, much branched, densely leafy glabrous shrub; petioles 1–2 mm. long, stout, margined; blades 12–18 mm. long, 6–12 mm.

wide, elliptical or slightly ovate, thickish, rigid, the margin sharply revolute, very glaucous underneath; midrib impressed above, very prominent beneath, the venation obscure; racemes terminal, shortly peduncled, simple; pedicels 10–20 mm. long, slender, angled, slightly thickened above, bearing toward the base two small nodes, as though marking fallen bracts; flower 12 mm. long, broad; calyx 3 mm. long, 4 mm. broad, as pressed, lobed about half way, the lobes broadly ovate, short-pointed, obtuse, thick; stamens about as long as the petals, the filaments stout, flattened, the anthers short and broad, broadest at the summit, with large pores; style 15–18 mm. long, slender, the stigma capitate; fruit 5 mm. long, 8 mm. broad, 7-lobed, bearing the persistent style.

"2 ft. high; near Apolo, 5800 ft., July 25, 1902" (*No. 1473*).

Vacciniaceae

Macleania elliptica sp. nov.

Glabrous; petioles 6–8 mm. long, very stout, dark-brown; blades 15–18 cm. long, 7–9 cm. broad, oval or slightly broader below, both ends very abruptly contracted into a very short and broad acumination, thick, pale, throwing off two pair of strong nerves near the base, these sulcate above, like the principal secondaries, the remaining venation faintly prominent above, all sharply prominent underneath; corymb nearly sessile, simple, the rachis very thick; pedicels 10–14 mm. long, stoutish, slightly thickened above, angled, articulated into the lightly concave base of the calyx; calyx-tube sub-hemispherical, a little shorter than the limb, which is 6 mm. broad, truncate, with 5 very small acute teeth; corolla 2 cm. or more long, gradually contracted toward the summit, the triangular-acuminate and acute teeth 3–4 mm. long, 3-nerved, the throat lightly pubescent; stamens 8 mm. long, the filaments one-fifth or one-fourth of the length, pilose, very broad, membranaceous, distinct, free from the corolla except at its very base; anthers lanceolate, the pores nearly as long as the cells and about half as wide, the sutures widely open above; cells finely and sharply granulose, broadened into a blunt, lightly recurved base; connective dark, thickened, bearing two short thick spreading horns; style exserted, slender.

"Rio Pelechuco, 4000 ft.; April 27, 1902" (*No. 2487*).

Myrsinaceae

Clavija tarapotana sp. nov.

Glabrous; leaves 4–8 dm. long, 4–7 cm. broad, oblanceolate, tapering regularly downward from a point distant about one-fourth of the length from the summit into a purple petiole 1–2 cm. long, the margin lightly revolute; pale-green, the midrib strongly keeled beneath, the principal secondaries about 18–24 pairs, with intermediate ones about half as strong, all interarching 1–2 mm.

from the margin, the reticulation very fine and very prominent on both sides; racemes 5–10 cm. long, long-peduncled; pedicels (in fruit) about 5 mm. long, stout, dilated regularly into the calyx, which is 4–5 mm. broad, 5-lobed about half way, the lobes rounded; fruits globoidal, most of them slightly depressed, 12 mm. broad, light-brown, faintly reticulate, tipped by a small style-base; seed 8 mm. long, borne on a short, flattened, lightly winged funicle, reddish-green.

"Slender, 6 ft. high; San Buena Ventura, 1500 ft., Nov. 20, 1901" (*No. 651*). The same as *Spruce's No. 4149* from Tarapota and also collected by Pearce.

Rapanea Sprucei sp. nov.

Glabrous, except the youngest portions, which are sparsely ferruginous-tomentellate; branchlets elongated, slender, spreading and ascending, rather densely leafy upon the densely flowered upper portions; petioles about 5 mm. long, margined; blades 3–5 cm. long, 1.5–4 cm. broad, oblanceolate, obtuse or acutish, acuminate at the base, thick, dark-green, lightly shining above with the venation lightly prominent, except the slightly impressed midrib, more so underneath, where the terete midrib is very prominent; rachis of the spikes 3–6 mm. long, thick, densely flowered; bracts short, broadly ovate, mostly acute; buds oval, 2 mm. long and nearly as broad; calyx 2–3 mm. broad, deeply lobed; corolla-lobes nearly 4 times the length of the calyx, oblong, obtuse, granular externally, purple-striped internally; anthers sub-sessile, attached to the base of the corolla, three-fourths of the length of the lobes and nearly equalling them in breadth; pistil half the length of the corolla, the ovoid ovary nearly as long as the short style and its two subulate stigmas.

"A tree 25 ft. high and 4 inches in diameter; Apolo, 4800 ft. alt., April 15, 1902" (*No. 181*).

The same as *Spruce's No. 4251* in fruit and Pearce's collection at San Luis.

Loganiaceae

Buddleia oblongifolia sp. nov.

Shortly and densely ferruginous tomentose, excepting the upper leaf-surfaces, loosely branched, the branchlets divergent, annulate, densely leafy; petioles 3 mm. long, margined, connate; blades 2–3 cm. long, 6–8 mm. broad, elliptical-oblong, thick, entire, the margin strongly revolute, above smooth and lightly shining, with the veins impressed, beneath ferruginous with the venation prominent, the 10–12 pairs of strong primaries interarching near the margin; inflorescence terminal, dense; bracts shorter than the calyx, linear, thick; calyx subsessile, campanulate, 5 mm. long and

broad, divided about a third of the way, the teeth and sinuses of nearly similar form and equal; corolla-tube 5–6 mm. long, the limb of equal breadth, the lobes nearly rotund, rugose on the face; filaments very short, inserted in the throat; anthers slightly exserted; ovary ovoid, nearly as long as the calyx, pubescent, the style and large oblong stigma about as long as the ovary.

"A spreading tree, 18 inches in diameter and 20 ft. high; Huarisate, 1300 ft., Aug. 28, 1901" (*No. 2416*).

This species is a close relative of *B. montana* Britton, but differs in its closer indumentum, upper leaf surfaces, larger and relatively longer flowers and different size and form of pistil.

Buddleia microcephala sp. nov.

Densely and shortly ferruginous tomentose; branches elongated, slender, sparsely leafy; leaves (only the uppermost seen) 9 cm. long, 12 mm. broad, lanceolate, attenuate above, below gradually contracted into a petiole-like base, entire, above green with the venation strongly impressed, underneath yellow with the venation very prominent, the stout secondaries about 12 pairs, interarching close to the margin, the veins closely and strongly reticulate; panicles very large, loosely branched, the branches elongated and slender, loosely flowered; bracts linear-attenuate; peduncles 2 or 3 mm. long; heads mostly about 5 mm. broad, 3–5-flowered, the flowers sessile; calyx 1.5 mm. long and broad, hemispherical-turbinate, 4-lobed nearly half way, the sinuses rounded, the lobes triangular-ovate, obtuse; corolla slightly longer than the calyx, lobed half-way, the lobes rounded, recurved; stamens included, exceeding the style, the anthers nearly sessile.

"Widely spreading, 10 feet high, and 3 inches in diameter; Apolo, 4800 ft., April 16, 1902" (*No. 156*).

Apocynaceae

Aspidosperma brevifolia sp. nov.

Petioles 12–25 mm. long, slender, slightly margined above, lightly channelled on the upper surface, keeled beneath; blades 4–8 cm. long, 2–4 cm. broad, lance-oblong, inaequilateral, acuminate at both ends, thinly coriaceous, glabrous, the venation inconspicuous. Panicle broad and lax, with tough branches. But one follicle seen, this recurved, 6 cm. long, 2 cm. broad and nearly as thick, oblanceolate, blunt, papillose-roughened, the pericarp thick and woody.

"A tree 70 ft. high and 16 inches in diameter, Rio San Juan, 3500 ft. alt., April 5, 1902" (*No. 255*).

Gothofreda apoloensis sp. nov.

White-tomentellate throughout; stems scandent, elongated, slender, terete; petioles slender, 2–4 cm. long; blades 4–8 cm. long,

2.5–5 cm. broad, ovate, deeply cordate with narrow sinus and rounded lobes, very abruptly short-acuminate and acute; peduncles, in flower, 6–12 mm. long, mostly 3–5-flowered; pedicels slender, mostly exceeding the peduncles; bud ovoid, acuminate and acute; sepals lance-linear, acuminate, one-third the length of the corolla, appressed; corolla-lobes lanceolate, obtuse, 8 mm. long, 2 mm. wide, green-white; crown nearly equalling the anthers, of 5 distinct, slightly overlapping lobes, the lobes rather broader than long, thick, purplish on the face, where they bear several intruded longitudinal folds; anthers half as long as the pistil, violet with dark-purple middle portion; stigmatic appendages dark-purple, lanceolate, obtuse; fruit 5 cm. long, 18 mm. broad, ovoid, acuminate and acute, umbilicate, sericeous.

"Apolo, 4800 ft., Aug. 22, 1902" (*No. 1447*).

Dipladenia mollis sp. nov.

Stem pubescent, erect, rather stout, 5 dm. high, leafy below, the leaves crowded, the lower smaller; petioles extremely short and broad; blades 2.5–5 cm. long, nearly orbicular, slightly mucronate, slightly cordate, softly tomentose, not coriaceous; upper portion of stem subulate-bracted, the bracts very small; flowers few; pedicels 12–20 mm. long, slightly thickened upward; calyx parted nearly to the base, the lobes erect, unequal, lanceolate, attenuate, keeled toward the top, the longest 5 mm. long; corolla pink, the tube 3 cm. long to base of lobes, the lower half cylindrical, 2 mm. wide, the upper half funnel-shaped, 12 mm. broad; limb about 7 cm. broad, the lobes rounded.

"Flowers pink; Tumupasa, 1800 ft., Dec. 17, 1901" (*No. 516*).

Species near *D. illustris*. The same as *Pearce's No. 797*.

Mandevilla tenuicarpa sp. nov.

Upper part of stem, both leaf-surfaces, etc. scabrous; stem slender, twining; petioles 3 mm. long, very broad; blades 7–10 cm. long, 4–7 cm. broad, oval-ovate, lightly cordate, abruptly contracted into a short, very acute acumination, the midrib and 6–8 pairs of strongly upcurved secondaries prominent underneath; raceme terminal, peduncled, at length elongated; flowers nearly sessile; calyx 2–3 mm. long, 3–4 mm. broad, divided nearly to the base, the teeth erect, triangular-acuminate and acute, the sinuses of nearly the same form; corolla-tube 2–5 cm. long to base of lobes, the middle portion contracted to about half-width; limb in the bud broadly ovoid-conical, obtuse; lobes about 18 mm. long when expanded, very broad, yellow; pods 15–20 cm. long, very slender, moniliform.

"Flowers yellow; Tumupasa, 1800 ft., Jan. 14, 1902" (*No. 875*). *No. 536* from the same locality, Dec. 16, 1901, is the same.

The species is near *M. tomentosa*.

Tabernaemontana mapirensis sp. nov.

Younger portions minutely puberulent. Branchlets elongated, pale-brown, striate, annulate with leaf-scars. Petioles 6–10 mm. long, rather slender; blades (only the upper ones seen) 7–15 cm. long, 3–6 cm. broad, ovate, acuminate and acute at the summit, less so at base, very thin, the secondaries 12–15 on a side, lightly upcurved and connecting close to the margin, slender and slightly prominent on both sides, the midrib slightly channelled above. Panicles terminal, short and broad, the bractlets very small, subulate. Pedicels slender, some 12 mm. or more long. Calyx-tube about 2 mm. long and somewhat broader, cupulate with sub-truncate base, the lobes triangular-acuminate or subulate, acute, strongly recurved, about a half longer than the tube. Corolla-tube 8–10 mm. long, the middle portion about half as thick as the base; corolla-limb about 3 cm. broad. Fruit not seen.

Species near to *T. laeta.*

"A tree, 4 in. in diameter. Mapiri, 1600 ft. alt., Sept. 23, 1901" (*No. 736*).

BORAGINACEÆ

Tournefortia subrotunda sp. nov.

Ferruginous-tomentose throughout, except the roughish minutely strigose upper leaf surfaces; branches elongated, stout, divergent; panicles axillary and terminal, peduncled, short, about 3–6 cm. broad; petioles about 8 mm. long, channelled above; blades 4–7 cm. long, 2.5–5 cm. broad, oval, sub-rotund at the base, very abruptly short-acuminate, entire, thick, above very dark, rugose, the midrib and 4–6 pairs of strongly ascending secondaries slightly or not at all impressed, beneath closely ferruginous-tomentose with the midrib and secondaries very strong and prominent; racemes 1.5–2.5 cm. long, stoutish, rather loosely flowered; bracts not apparent; calyx 2 mm. long, divided nearly to the base, the lobes lance-linear, acuminate; corolla 4 mm. long, densely ferruginous, the tube cylindraceous, angled above, slightly narrowed just below the middle, the limb nearly at right angles, 3 mm. broad, the lobes triangular-acuminate, dark-purple; fruit deeply 3–4-lobed, 6 mm. broad, reddish purple.

"Ten feet high; Charopampa, 1600 ft., Sept. 19, 1901" (*No. 761*).

VERBENACEAE

Citharexylon megacanthum sp. nov.

Branchlets stout, glabrate, sulcate; spines glabrate, divaricate, stout, pungent, straight; peticles 3–5 mm. long, stout; blades 12–25 mm. long, 8–16 mm. wide, obovate with rounded summit, abruptly contracted into the petiole, above bullate, the yellowish midrib and 4 or 5 pairs of secondaries very stout and prominent

underneath, the margin revolute; racemes axillary, 2.5–5 cm. long in fruit, peduncled, the fruits rather few, on short, stout, recurved pedicels; fruiting calyx 6 mm. broad, spreading, the lobes broad, unequal; fruit globose or slightly broader than long, deep purple, 6–7 mm. broad.

"A bush 10 ft. high; hills back of Mollendo, Peru, 2000 ft., Aug. 5, 1901" (*No. 2544*).

Lippia pendula sp. nov.

Velvety-hairy; branches long, slender, strongly ascending, somewhat quadrangular; longest petioles 15 mm. long, stout; blades 1.5–6 cm. long, 8–30 mm. broad, oval or ovate, barely acute, rounded to sub-cordate at the base, finely crenate, thick, deep-green above, gray beneath, the upper surface finely bullate, the slender yellow midrib and secondaries prominent beneath; heads clustered in the axils, some pendulous on the slender peduncles which are 8 mm. long and pilose; heads 5 or 6 mm. broad and some a little longer, the broadly ovate, acute scales closely imbricated; flower 5 mm. long, the ovoid pilose calyx one-third the length of the corolla-tube, its triangular teeth very small; corolla pilose, the purple tube slender, with an abrupt enlargement just above the middle which contains the anthers, then again contracted; the yellow limb abruptly expanded, 2 mm. broad, with rounded lobes.

"A slender bush, 8 ft. high; Apolo, 4800 ft., Feb. 27, 1902" (*No. 307*). *No. 96*, from the same locality, Feb. 23, is the same, as is *No. 162*, from the same locality, collected April 16, the leaves larger than those of the others.

Species very near *L. origanoides* H.B.K.

Labiatae

Mesosphaerum grandiflorum sp. nov.

Finely scabrous; branchlets obtusely quadrangular, sulcate; petioles (only upper seen) 4–6 cm. long, stout, widely spreading, lightly costate; blades 8–16 cm. long, 2.5–5 cm. broad, lanceolate, long-acuminate, sub-cordate, crenulate-denticulate, above green, very finely bullate, with few small rough hairs, beneath gray-tomentose, the secondaries about 12 pairs, very strongly ascending, the venation strongly prominent underneath, reddish; cymes long-peduncled, 5–10 cm. broad, very dense, forming a broad, loose panicle; pedicels slender, longer than the calyx, thickened upward, recurved in fruit; calyx-tube 6 mm. long, nearly 2 mm. broad at the summit, slightly narrowed downward, 10-ribbed, bright purple, the teeth small, erect, sub-equal, triangular, acuminate; corolla-tube about a half longer than the calyx, the limb abruptly spreading; stamens slightly, the style long exserted.

"A shrub 10 ft. high; Apolo, 4800 ft., July 2, 1902" (*No. 1512*). The species is apparently near *M. arboreum*.

Solanaceae

Lycium divaricatum sp. nov.

Divaricately much branched, the branchlets and leaves cinereous, the spinose branchlets about 10–30 mm. long; leaves fascicled on a node-like base, 6–12 mm. long, 1–3 mm. wide, oblanceolate, obtuse, tapering to the base, thick, the midrib very stout, the margin revolute; pedicel about 6 mm. long, thickened at the summit; calyx 4 mm. long, tubular, divided two-thirds of the way, the sinuses rounded, the lobes lanceolate, obtuse; corolla infundibular, 13 mm. long, the lanceolate, obtuse, recurved or spreading lobes about 3 mm. long, slightly exceeding the small, short anthers; stigma large, capitate, strongly two-lobed; berry about 4 mm. long, deep red-purple, the seeds few and large.

"A spreading bush, 10 ft. high; Yura, 8400 ft., Aug. 10, 1901" (*No. 2554*).

Brachistus subfalcata sp. nov.

Branchlets elongated, stout, flexuose, terete, pilose with coarse yellow spreading hairs, the internodes at length about 5 cm. long; leaves tapering into a very short, stout, margined petiole, 10–20 cm. long, 4–8 cm. wide, lance-oblong, sub-falcate, acuminate at both ends, very acute, thin, sparsely pilose or sub-strigose on both surfaces, the strongly ascending slender secondaries about 10 on each side; flower not seen; pedicels mostly 3–5, slender, about 10 mm. long in fruit; fruiting calyx about 8 mm. broad; fruit subglobose, about 10 mm. long, deep red purple.

"San Buena Ventura, 1400 ft., Nov. 14, 1901" (*No. 660*).

Brachistus coccinea sp. nov.

Petioles 8–20 mm. long; blades 5–15 cm. long, 2–7 cm. broad, lance-ovate to ovate, slightly or not inaequilateral, thickish, rigid, entire, glabrate above, finely strigose beneath, the secondaries about 10 on each side, very slender; fascicles about 5–8-flowered; flowering pedicels 3–5 mm. long, 2 or 3 times as long in fruit, upwardly thickened and faintly angled; flower about 5 mm. long, broadly campanulate; calyx about half the length of the corolla, divided about half way, the ten teeth linear, in fruit about twice as large and recurved; corolla (yellowish) puberulent, divided about half way, little exceeding the short and broad anthers; fruit globose or slightly oblate, about 7 mm. broad when dry, scarlet, heavily wrinkled.

"Six feet high; San Buena Ventura, 1400 ft., Nov. 30, 1901" (*Nos. 623 and 634*).

Solanum caricaefolium sp. nov.

Glabrous, excepting the lower leaf surfaces and young parts, which are lightly strigose, and the branchlets, petioles and midribs, which bear a few straight, short, slightly laterally compressed, yellow spines; branchlets deep-purple; petioles 8–40 mm. long, rather stout, blades bright green, 7–15 cm. long, 4–12 cm. wide, ovate, obtuse to truncate at the base, acuminate at the summit, coarsely lobed, some very deeply, the lobes irregularly lanceolate and acuminate, the sinuses obtuse; cymes peduncled, bifid, the branches scorpioid, rather many-flowered; bud lanceolate; calyx divided nearly to the base, the lobes 5 mm. long in flower, 10 mm. in fruit, tapering gradually from the base to the acute summit; corolla white, 12 mm. long; filaments slender, 2 mm. long, the anthers very unequal, the largest 5 mm. long, narrow, slightly curved, the pores looking almost directly upward; fruit globose, smooth, 8 mm. broad.

"3 ft. high; San Buena Ventura, 1400 ft., Nov. 12, 1901" (*No. 648*).

The same as *Spruce's No. 4615.*

Solanum Williamsii (Sect. Andropedas) sp. nov.

Densely ferruginous stellate-tomentose throughout, the hollow branches stout, reaching several yards in length; petioles short, very stout; blades 10–20 cm. long, nearly as broad, rhomboidally oval or ovate, entire, very thick, very abruptly contracted at both ends, acute, the stout secondaries about 6 on each side, the venation lightly impressed above; racemes about 12 cm. long, pendulous, the peduncle about 2 cm. long, stout like the flexuous, nodose rachis; pedicels very stout, 10 mm. long; calyx 30 mm. broad, divided two-thirds of the way, the lobes ovate, obtusish; corolla violet, densely tomentose externally, the inner face with impressed, purple veins, about 4 cm. broad, rotate, divided nearly to the base, the lobes lance-ovate, acutish; stamens 5, the very short and broad filaments lightly connate, one slightly longer; one anther slightly longer (11 mm.), all brown-verrucose, elongated, narrowed toward the summit, nearly straight, the pores looking upward and outward, the connective somewhat thickened toward the top, the longitudinal sutures continuous with the pores; style curved, exceeding the anthers.

This species is near to *S. styracioides* Rusby, though conspicuously different in its indumentum, and, as in the case of that species, it is difficult to exclude it from *Cyphomandra.* There is a tendency toward elongation of the tip of the connective into a mucronation.

"Vine-like stems sometimes 3 or 4 yards long; Tumupasa, 1800 ft., Dec. 10, 1901" (*No. 424*).

Cyphomandra subcordata sp. nov.

A tree of 10 m., with trunk 20 cm. in diameter; leaves 25–40 cm. long, 3–7-foliolate, petioled; leaflets very unequal and irregularly distributed, petioluled, 5–25 cm. long, broadly and inaequilaterally ovate, sub-cordate or cordate, abruptly and sharply acuminate, entire, thin, strigose on both surfaces; racemes pedunculed, reaching 40 or 50 cm. in length, bifid, slender, drooping, the small nodules approximate; flowers 12 cm. long, apparently light bluish-purple; calyx half the length of the corolla, finely strigose, thickish, parted nearly to the base, the lobes oval, mucronate; corolla campanulate, parted nearly half-way; fruit oval to obovoid, with rounded summit; seeds 3 mm. long.

"A tree 30 ft. by 8 in. diameter. San Buena Ventura, 1400 ft., Nov. 30, 1901" (*No. 606*).

The same collected by Goudot in New Grenada.

Sessea rugosa sp. nov.

Branchlets slender, scurfy; leaves short-petioled, lanceolate, coriaceous, rugose, shining above; flowers panicled, sessile, scurfy; seeds sharply angled, rough.

Stellate-scurfy throughout, with the exception of the upper leaf-surfaces; branches erect, slender; petioles about 6 mm. long, broad, the channel on the upper surface continuous with a strong groove of the midrib; blades 5–10 cm. long, 10–20 mm. broad, lanceolate, very abruptly produced into the petioles, acuminate and acute, thick and coriaceous, above slightly lustrous and rugose with the strongly impressed venation, underneath finely yellowish-stellate, with the venation strongly prominent, the secondaries 6 or 8 on a side, strongly ascending; flowering branchlets mostly 5–7 cm. long, loosely branched, the divisions few-flowered; pedicels reduced to mere nodes, bearing broad whitish scars after the fall of the fruit; buds oblong, obtuse; flowers not seen; fruiting calyx 10 mm. long, campanulate, strongly 5-ribbed, or slightly angled, divided about one-third of the way, the sinuses acute, the lobes triangular, sharply acuminate; pod nearly enclosed in the calyx, elliptical-ovoid, obtuse, 6–8 mm. long, subtended by the conspicuous saucer-shaped disk, which has a sinuate, light-colored margin; seeds sharply angled and rough.

"Slender, 10 ft. high, the mature fruit purple. Apolo, 4800 ft., Apr. 21, 1902" (*No. 2449*).

Gesneriaceae

Monopyle divaricata sp. nov.

Pubescent throughout, the hairs of the leaf-surfaces sparse, short and stout; stems rooting at the base, then ascending, 3 dm. high in my specimen, stoutish but weak, sulcate, the internodes about 3–4 cm. long; petioles 4–6 cm. long, slender, widely spread-

ing, the blades about as long and broad, cordate with broad shallow sinus, abruptly short-acuminate, coarsely dentate, thin, the secondaries about 5 pairs, strongly upcurved; pedicels about 8–12 mm. long, slender, widely spreading; calyx-tube, in flower, 5–7 mm. long, oblong, slightly broadened upward, the lobes unequal, averaging about the length of the tube, linear; corolla campanulate, 2 cm. long and broad, the margin loosely fimbriate; stamens short, in the base of the corolla, the style less than half as long as the corolla; capsule linear-oblong, 2.5 cm. long, the persistent calyx-lobes recurved, larger than in the flower.

"Flowers white; Tumupasa, 1800 ft., Jan. 14, 1902" (*No. 578*).

Rubiaceae

Sabicea erecta sp. nov.

An erect shrub, gray-tomentose or hirsute throughout; branchlets elongated, thick but weak, flexuous, ascending, the internodes about 2.5–5 cm. long; stipules broadly ovate, obtuse, about 8 mm. long, 6 mm. wide, reflexed, purple above; petioles 8 mm. long, stout; blades 5–9 cm. long, 3–5 cm. broad, ovate, very abruptly contracted into the petiole, short-acuminate and acute, thickish, dark above, light-gray beneath, the strongly up-curved secondaries about 12 pairs; peduncles solitary in the axils, 18–25 mm. long, erect, stout; cymes about 2.5 cm. broad, sub-hemispherical, dense; pedicels about half the length of the flowers; bracts ovate, acuminate, shorter than the calyx; calyx-tube campanulate, rather shorter than the lanceolate, acuminate spreading lobes, which are 3–4 mm. long; corolla 6 mm. long, the tube rather shorter than the lanceolate lobes; anthers and 5 styles about reaching the base of the corolla-lobes; disk narrow and thick.

"A bush 8 ft. high; Tumapasa, 1800 ft., Dec. 13, 1901" (*No. 446*). *No. 590*, from the same locality, June 18, 1902, is the same.

Species very near *S. cuneata* Rusby, which also appears to be erect.

Randia oblanceolata sp. nov.

Glabrous. Branchlets slender, light-gray. Petioles about 1 cm. long, the blades 6–13 cm. long, 2.5–4 cm. broad, oblanceolate with cuneate base and abruptly short-acuminate, obtuse summit, very thin, bright-green, the principal secondaries about 10 on each side, strongly upcurved, very slender, lightly prominent on both sides. Fruit sub-sessile, globose, about 1.5 cm. long, the beak broader than long, the calyx teeth 6 or 7 mm. long, slenderly spiniform, pungent.

"A stout shrub, 10 ft. high. San Buena Ventura, 1400 ft. alt., Nov. 22, 1901" (*No. 617*).

Palicourea (?) **longipes** sp. nov.

Trunk gray; scabrous-tomentellate throughout; branchlets elongated, slender, loosely ascending, purple, irregularly angular; stipules 6–8 mm. long, attenuate, widely separated, but connected by a basal line; petioles about 5 mm. long, stout, margined; blades 6–9 cm. long, 2.5–4 cm. broad, ovate, abruptly contracted into the petiole, short-acuminate and acute, thick and rigid, drying yellowish-green, the purplish midrib and 12 pairs of secondaries very prominent beneath, the latter very strongly upcurved and scarcely connecting at the margin; peduncles terminal, 7–12 cm. long; panicles about 5 cm. long, 2.5–4 cm. broad, ovoid, dense; bracts of the inflorescence attenuate; pedicels mostly half to two-thirds the length of the fruit, erect, stout; fruits 4–5 mm. long, broadly ovoid, deeply sulcate, bearing a calyx 1.5–2 mm. broad, the lobes broadly triangular-ovate, acutish or obtuse.

"A bush 10 ft. high, with red flowers; Tumupasa, 1800 ft., Jan. 21, 1902" (*No. 558*).

Caprifoliaceae

Viburnum Spruceanum sp. nov.

Younger portions and lower leaf-surfaces ferruginous-puberulent; branchlets stout, spreading, coarsely angled, purple; internodes 2.5–4 cm. long; petioles 6–8 mm. long, broad, channelled above; blades 5–8 cm. long, 3–7 cm. broad, oval-elliptical, rounded to sub-cordate at the base, very slightly pointed, thick, the purple midrib and 5–7 pairs of stout secondaries impressed above, strongly prominent underneath, terminating in very slight teeth, connected by the tertiaries; cymes terminal, compound, stoutly peduncled, dense; flowers not seen; fruits subulate-bracted at the base; globoidal, 5–6 mm. broad, reticulate, tipped by the short, broad, acute, whitish erect calyx-teeth, which are slightly exceeded by the short stout styles.

"Seven feet high; Apolo, 4800 ft., April 20, 1902" (*No. 2451*).

The same as *Spruce's No. 5104*, at Kew.

Lobeliaceae

Siphocampylos subcordatus sp. nov.

Branchlets elongated, stout, erect-spreading, finely many-nerved, leafy; petioles 3–8 mm. long, stout, mostly twisted; blades 4–7 cm. long, 2.5–5 cm. wide, ovate, truncate at the base, mostly rounded at the summit, lightly sinuate with minute teeth, above dark green, slightly shining, rugose, the venation strongly impressed, underneath short-hairy and scabrous, the venation strongly prominent, the 5 or 6 pairs of secondaries interarching; peduncles mostly solitary in the axils, 3.5–5 cm. long, slender, recurved or reflexed near the summit, angled; calyx-tube hemi-

spherical or broader, 6–8 mm. broad, in flower, 5- or 10-ribbed; calyx-lobes 12 mm. long, mostly ascending, narrowly linear; corolla falcate in the bud, nearly straight when expanded, 4–4.5 cm. long, the tube 8 mm. wide at the summit, thence gradually and regularly narrowing to half as wide near the base, sparsely pilose without; corolla-lobes half the length of the tube, lanceolate, attenuate, recurved, about the length of the densely white-pilose stamens.

"Slender, 8 ft. high; Apolo, 4800 ft., June 29, 1902" (*No. 1507*). Species apparently near *S. macropodoides* Zahlb., *ex descript.*

Siphocampylos Williamsii sp. nov.

Stems erect or ascending, 3–6 dm. high, slender, flexuous, leafy, angled, scabrous; leaves erect, 4–7 cm. long, 6–8 mm. broad, the lower smaller, oblong-linear, acuminate and acutish, gradually contracted into a very short petiole, the margin strongly revolute and bearing very small, scattered, salient calloused teeth; lower surface pale, muriculate, the strong midrib prominent; peduncles 2–7 cm. long, erect, slender; calyx-tube hemispherical, 5–6 mm. broad (in flower), 5- or 10-ribbed, the lobes 5–6 mm. long, lance-linear, mostly erect, obtusish, thick; corolla rose-purple, 3 cm. long, straight, the lower third abruptly narrowed, the upper portion nearly equal, about 5 mm. wide, as pressed, prismatic, the lobes lance-linear, long-acuminate, equalling or nearly equalling the stamens; anthers about 5 mm. long, naked except for the coarse and rigid terminal beard.

"Cargadira, 8000 ft., July 29, 1902" (*No. 1520*). Species very near *Spruce's No. 4360.*

Siphocampylos aggregata sp. nov.

Glabrous, except the minutely puberulent rachis and pedicels; stems and branches elongated, slender, weak, hollow, apparently reclining; petioles 12 mm. long, broad; blades 10–20 cm. long, 5–7 cm. broad, lanceolate, obtuse, abruptly contracted into the petiole, crenate with minute teeth in the sinuses, thin, bright-green, the 8–10 pairs of very slender secondaries strongly ascending; peduncle very long (3 dm. in my specimen), the pedicels 2.5–5 cm. long, crowded upon a very short thick nodose rachis, which is apparently hollow; bracts small, foliaceous, lanceolate; calyx-tube hemispherical, 5–6 mm. broad, 10-ribbed, the lobes 5–6 mm. long, triangular-acuminate, obtuse; corolla strongly curved, 4 cm. long, the upper third gradually dilated, the lobes attenuate, recurved; stamen-column regularly dilated upward, white-tomentose; anthers 6–8 mm. long, purple-pilose; hairs of the beard coherent; stigmas large and broad.

"Seven feet high, with slender branches; Rio Machichorisa, 3500 ft., Aug. 4, 1902" (*No. 1579*).

Very near *Matthews' No. 1676*, and near *C. nutans* and *C. solanifolia.*

Centropogon roseus sp. nov.

Youngest parts minutely and sparsely puberulent, or glabrous; stem erect, stoutish but not strong, angled; leaves erect or erect-spreading, 1.5–3 dm. long, 5–8 cm. broad, obovate or oblanceolate, obtuse, tapering into an extremely short petiole, the margin beset with very small, salient, calloused teeth, very thin, bright green, the venation inconspicuous, broad and weak, the secondaries 12–16 pairs, ascending; raceme terminal, few-flowered, leafy-bracted, the flowers rose-colored; bracts 2.5–4 cm. long, broadly oval or obovate, toothed like the leaves and calyx-lobes; pedicels 2.5–3 cm. long, very slender, spreading, angled; calyx foliaceous, the tube hemispherical-campanulate, 6 mm. wide, lightly 5-ribbed the limb campanulate, 1.25 cm. long, the lobes broadly oval; corolla 4 cm. long, falcate, broadest at the mouth, thence gradually contracting downward, strongly nerved; anthers 6 mm. long, the white beard coarse and rigid, style slightly exceeding the anthers, stout, the stigmas large, diverging, unequal.

"Four feet high; Tumupasa, 1800 ft., Jan. 10, 1902" (*No. 584*).

According to description, very near *C. grandicephalus* Zahlb. but inflorescence and flower-characters different.

COMPOSITAE

Piptocarpha laxa sp. nov.

Branchlets, inflorescence and lower leaf-surfaces yellowish-tomentellate. Branchlets slender, divaricate, striate. Petioles 1–2 cm. long, channelled above, carinate beneath; blades 6–12 cm. long, 2–6 cm. broad, ovate, the base rounded and mostly slightly inaequilateral, the summit acutish; thick and coriaceous, entire, the secondaries about 10 on a side, anastomosing near the margin, sharply prominent underneath, the slender venation strongly reticulate, prominent on both surfaces. Panicles mostly 3 or 4 cm. long, somewhat secund. Involucres 4 or 5 mm. broad when fully expanded, the scales thick and rigid, broadly ovate, acute, the outermost very small. Akenes brown, about 3 mm. long, strongly angled, tapering regularly from summit to base, the pappus 6 mm. long, white, coarse, serrate.

"Charopampa, 1600 ft. alt., Sept. 22, 1901" (*No. 703*).

Vernonia breviramosa (Sect. Scorpioideae) sp. nov.

Gray-tomentose; branches elongated, little branched, terete; leaves 7–10 cm. long, 15–30 mm. broad, lanceolate, long and regularly acuminate and acute, the base gradually contracted into a margined petiole; lightly serrate, above brownish-green, beneath gray, the 5–7 pairs of yellowish secondaries very strongly as-

cending, thickish; panicle contracted, rather loose, the flowering branchlets nearly sessile, 2–5 cm. long, densely flowered; heads sessile, 6 mm. long, the scales nearly equalling the white pappus; outer scales densely long-hirsute, ovate, with nearly uniform tips, the next similar but successively broader, the innermost much longer, purple, thin, acuminate; corolla slenderly infundibular, the lobes long and slender; akene short and stoutly conical, the outer pappus about two-thirds of its length, yellowish, narrowly paleaceous.

"Eight feet high; Apolo, 4800 ft., July 1, 1902" (*No. 1431*).

Very near, if not the same as *Matheus' No. 1365*.

Vernonia crassifolia (Sect. Scorpioideae) sp. nov.

Stems stout, lightly angled, the branches elongated, ascending, puberulent; petioles short and very stout; blades 7–15 cm. long, 5–10 cm. broad, ovate, short-pointed, rounded or slightly cordate at the broad base, entire, thick, above sparsely and somewhat harshly pubescent, and heavily rugose with the impressed venation, beneath hirsute with the venation very strong and rather finely reticulate; panicles short and dense, bearing reduced leaves similar to those of the stem, the flowering branchlets 5–7 cm. long, recurved, densely flowered; heads 6 mm. long, the involucre in the flowering state just equalling the pappus, campanulate, 7 mm. broad, purple, the outer scales ovate, acute, thick, the inner series much longer, light-purple, narrower, obtuse; akene short and broad, turbinate, the pappus fine, white, the outer paleaceous, half or more the length of the akene.

"Ten feet high; Apolo, 4800 ft., July 12, 1902" (*No. 1513*).

Vernonia squamipes (Sect. Paniculatae) sp. nov.

Minutely strigose; branchlets slender, ascending, leafy, deep-purple, many-sulcate or -costate; leaves 3–5 cm. long, 15–30 mm. broad, lanceolate, acuminate and acute, tapering into a short petiole, irregularly short-serrate, thickish, deep-green above, yellowish-green with strong purple coarsely reticulate venation beneath, the secondaries about 15 pairs, strongly ascending; panicles rather small, the branches about 2–4 cm. long, recurved, the heads erect on peduncles about 12 mm. long, thickened upward and clothed throughout with densely imbricated ovate acute scales; involucre proper 4 or 5 mm. long, the scales ovate or obovate, mostly acute, thick, the tips dark, the inner successively longer; brown pappus exceeding the involucre by more than half the length of the latter; akene black, nearly 2 mm. long, of nearly equal thickness throughout, strongly 10-ribbed, slightly roughened; pappus nearly twice the length of the akene, coarse, rigid, the outer very short, not at all chaffy.

"Six feet high, the stem 1 inch in diameter; Tumapasa, 1800 ft., Jan. 4, 1902" (*No. 522*).

Vernonia digitata (Sect. Scorpioideae) sp. nov.

Branches and inflorescence gray-tomentellate, the lower leaf-surfaces sparsely puberulent; stems erect, apparently simple, very stout, purple, coarsely angled, sparsely leafy; leaves 15–20 cm. long, 3–6 cm. wide, lanceolate, inaequilateral and the upper somewhat falcate, acuminate and acute, acuminate and clasping at the base, distantly sinuately serrate, the teeth short, broadly triangular, acute or mucronulate; thick, coarsely reticulate, the venation very prominent on both sides, the stout secondaries 12–14 pairs; panicle large, loose, its leaves linear, acuminate; branches of the inflorescence mostly sessile, 5–10 cm. long, slender, densely flowered; heads sessile, 5–6 mm. long, the involucre about two-thirds of the length, broadly campanulate, loosely imbricated, the scales ovate and obtuse below, becoming lanceolate and acute within; corolla a little shorter than the pappus, slenderly infundibular, the lobes long, spreading, broader toward the end, the white anther-appendages large, spreading; akene short; pappus white, fine, the outer very short and sparse, minutely broadened at the base.

"Six feet high; Mapiri, 1600 ft., Sept. 24, 1901" (*No. 713*).

Species near *V. secunda*.

Vernonia Conwayi (Sect. Scorpioideae) sp. nov.

Gray-tomentose, the upper leaf-surfaces finely strigose; branches elongated, slender, very flexuose, sulcate; leaves (only the upper seen) 12–20 cm. long, 4–7 cm. broad, lanceolate, acuminate, amplexicaul, the basal lobes rounded, the margin regularly and obscurely crenate; panicle very large and much branched, light-brown, the flowering branchlets very short, dense; heads sessile, 5 mm. long, the involucre nearly equalling the pappus, broadly campanulate, the scales rather few, loosely imbricated, ovate, obtuse, very thick, light-brown, marked with light purple; akenes linear, two-thirds as long as the pappus, strongly ribbed; pappus white, rather fine, the outer short, abundant, narrowly paleaceous.

"Eight ft. high; near Inglis-Inglis, 5500 ft., Aug. 16, 1902" (*No. 1493*).

Vernonia ixiamensis (Sect. Oligocephala) sp. nov.

Scabrous; stems strict, the branches erect, slender, elongated, purple, lightly pilose and only slightly scabrous; leaves erect, 2–3 dm. long, 10–18 mm. wide, linear, mostly obtuse, closely sessile, the margin minutely toothed, strongly revolute; thick and rigid, rugose, lightly shining above, the heavy venation coarsely reticulate, prominent on both sides; heads few, distantly (mostly 4–7 cm. apart) arranged, sessile in the axils of small leaves, about 18 mm. long and broad; involucre broadly campanulate, the scales numerous, lanceolate, acuminate and pungent; corollas rather

stout, dilated above, the lobes long and spreading; style-branches elongated, tapering; akene 1.5 mm. long, narrowly conic, strongly ribbed, the pappus white, coarse, 8 mm. long, the outer about two-thirds the length of the akene, narrowly paleaceous.

"Five ft. high; Ixiamas, 1500 ft., Dec. 24, 1901" (*No. 284*).

Vernonia densipaniculata sp. nov.

Scabrous, except the softly ferruginous-tomentose lower leaf-surfaces; stems rather stout, purple, erect-branched; leaves 5–10 cm. long, 15–35 mm. wide, lance-ovate, mostly inaequilateral, acuminate and acute, tapering into a short petiole which has a broad attachment, minutely crenate, thick, finely and strongly bullate above, the midrib and about 15 pairs of secondaries very strong and prominent beneath, the latter curving outward and upward at an angle of about 45 degrees; panicles short and broad, very densely branched, the branches 4–8 cm. long, recurved, the heads rather densely distributed (about 3–5 mm. apart); involucres 5–6 mm. long, broadly campanulate-turbinate, exceeded by about half its length by the dark-brown pappus; scales of the involucre rather few, loosely imbricated, the outer linear, attenuate and pungent, the inner successively longer, broader and less pointed or the innermost even obtuse, thick; corollas not seen; pappus coarse, rigid, the outer about two-thirds the length of the conical, short, densely hirsute akene.

"Four ft. high; Cargadira, 8000 ft., July 29, 1902" (*No. 1534*).

Stevia filipes sp. nov.

Finely scabrous throughout. Stems 2.5–5 dm. high, very slender, simple or with one or more erect branches, terete, striate, purple, especially above, the inflorescence very loosely and openly paniculate, with very slender branches. Leaves sessile, but with petiole-like bases, 2–4 cm. long, 5–15 mm. broad, ovate, obtuse, abruptly contracted into the margined petiole-like base, coarsely, unequally and obtusely serrate, with sub-acute sinuses, thick and rigid, the copious and coarse erect or strongly ascending venation exceedingly prominent underneath. Leaves of the inflorescence successively smaller, few. Peduncles filiform, mostly 1–2 cm. long. Heads solitary, 6–9 mm. long, the involucre about two-thirds of the length and 4.5 mm. broad at the summit, its scales narrowly lanceolate, with attenuate, slightly spreading summits. Flowers about 5, the slender akenes about two-thirds the length of the narrow, corolla-like tube, which enlarges slightly toward the summit. Corolla coarsely pilose throughout, the lobes oval, about half as long as the tube. Setae 4, unequal, slender, with rather large, basal scales.

"Hills near Apolo, 6000 ft. alt., Feb. 20, 1902" (*No. 124*)

Stevia reclinata sp. nov.

Branches elongated, very slender, ascending or abruptly reclining, red, finely and sparsely pilose with short white hairs. Petioles 5 or 6 mm. long; blades 4–6 cm. long, 1.5–4 cm. broad, ovate, abruptly contracted at the base into a short, broad acumination, acute, coarsely serrate with broadly ovate teeth and narrow sinuses, very finely scabrellate on both surfaces, the venation finely reticulate on both surfaces, especially underneath. Panicles axillary, slenderly peduncled and bearing one or more pairs of small, lanceolate entire leaf-bracts, about 2 or 3 cm. broad and half as long, dense. Involucres sub-sessile, 6 or 7 mm. long, slender, about twice as broad at the summit as at the base, the scales green, narrowly lanceolate, acuminate, scabrous, carinate, finely nerved. Flowers about 4, 5 or 6 mm. long, the corolla-tube pilose, narrowly infundibular, the lobes ovate. Akene a little more than half the length of the corolla, very slender, sharply angled, black at maturity. Pappus-bristles 3, exceeding the corolla, scabrous, several very small scales at the base.

Species near *S. Boliviensis*.

"Three ft. high, with white flowers. Near Apolo, 5800 ft. alt., July 25, 1902" (*No. 1468*).

Mikania sinuata sp. nov.

Stems slender, finely costate, purple, sparsely ferruginous-tomentose except about the nodes, where they are abundantly so; petioles 3–4 cm. long, slender; blades 6–8 cm. long, broadly ovate, deeply cordate, abruptly short-acuminate and mucronate, the large basal lobes sub-rounded, the margin rather coarsely sinuate-dentate, thin, 5–7-nerved, the venation slender and coarsely reticulate, both surfaces slightly scabrous and minutely resinous-dotted; corymbs very long-peduncled, the peduncles sparsely tomentose, strongly nerved, the branchlets compressed and narrowly winged at the points of branching; peduncles slender, sharply angled or narrowly winged; scales of the involucre 3 mm. long, obtuse, strongly 3–5-nerved, about twice the length of the akene; akene linear, black, glabrous, sharply angled, about as long as the narrow lower portion of the corolla-tube; upper portion of corolla-tube rather shorter than the lower, campanulate, lobed more than half-way; style-branches thick, little exceeding the anthers; pappus equalling the corolla.

"San Juan, 3200 ft., March 20, 1902" (*No. 207*).

The same as *Rusby's No. 1648*.

Mikania baccharoidea sp. nov.

Ferruginous-puberulent; branchlets elongated, slender, widely spreading, purple, striate, very leafy; petioles 5–8 mm. long, slender, narrowly margined; blades 2.5–5 cm. long, 12–25 mm.

broad, ovate, mostly inaequilateral, short-pointed and obtuse, very abruptly contracted into the petiole, entire or with one or more obscure blunt teeth near the base, thick and rigid, the venation lightly impressed above, very prominent beneath, two slender, crooked nerves starting very near the base and losing themselves in the margin, two much stronger ones starting a little higher and continuing to the summit, the venation coarsely reticulate; panicles pyramidal, leafy, the bracts and bractlets small, linear; heads mostly short-peduncled; scales of the involucre oblanceolate-linear, obtuse, 3 mm. long, exceeding the oblong, light-brown, strongly angled, puberulent akenes; pappus about 3 mm. long, fine, white, rather copious; corolla-tube abruptly divided at the middle into a lower, slender, strongly nerved portion, and an upper campanulate portion which is lobed more than half way; anthers about half as long as the campanulate portion of the corolla; style-branches very long, terete, grayish-puberulent.

"Climbing over bushes; Cargadira, 8000 ft., July 30, 1902" (*No. 1604*).

Grindelia obovata sp. nov.

Glabrous except for a very minute puberulence on the young stems and upper surfaces of the young leaves. Branches rather slender, reddish-brown, striate, leafy. Leaves 1–2 cm. long, 6–12 mm. wide, oblanceolate, closely sessile or sub-amplexicaul, the rounded summit terminating in a pungent tooth similar to those of the margin, very thick, pale green, the venation obscure, finely much wrinkled in drying. Heads few, the involucres 12–15 mm. broad, and two-thirds as long, somewhat squarrose, the scales acuminate and acute, many of them purplish. Rays about 15–20 mm. long, narrowly oblanceolate, entire or minutely toothed. Tubular flowers about 6 mm. long, very slender, their short lobes broadly ovate, obtuse. Pappus entire, coarse, the longest nearly equalling the disk-flowers. Akenes not seen. (Dissection material scanty.)

"Arequipa, Peru, 7500 ft. alt., Aug. 8, 1901" (*No. 2535*).

Diplostephium foliosum sp. nov.

Yellow-tomentose, except the upper leaf-surfaces. Stems simple or nearly so, erect, 2–5 dm. high, stoutish, densely leafy. Leaves 2–4 cm. long, 7–15 mm. broad, regularly obovate, mucronate, acuminate at the base into a short and stout petiole, the upper part of the revolute margin usually with 2–6 small salient teeth, very thick, deep-green above, yellow beneath, the midrib stout, the venation obscure. Heads several at the summit, in a close sub-sessile corymb, stoutly peduncled, the linear bracts of the peduncle appearing like outer involucral scales; 10–12 mm. long, the turbinate or campanulate involucre nearly equalling the pappus. Scales of the involucre lanceolate, acuminate, obtusish,

very thick, sub-carinate, bearing two glands or callosites at the base. Ray-flowers not seen, those of the disk lightly exceeding the pappus, infundibular, the lobes ovate, recurved. Stamens whitish, exceeding the corolla, the very thick style-branches recurved and twisted. Akene short, black, angled, smooth. Pappus white, copious.

"Cargadira, 8000 ft. alt., July 29, 1902" (*No. 1529*).

Baccharis rubricaulis sp. nov.

Upper leaf-surfaces minutely papillose, at least when young. Branchlets erect or strongly ascending, stout, angled, bright-purple, like the petiole and midrib, very leafy. Petioles about 6 mm. long, stout. Blades 5–8 cm. long, 15–30 mm. broad, lanceolate, acute, abruptly contracted into a basal acumination, finely and sharply serrate with sub-salient teeth, thick, the rather crooked secondaries numerous, the strongly reticulate venation prominent on both surfaces, especially underneath. Heads in small, broad, dense terminal corymbs, about 4 mm. long and broad, the campanulate involucre nearly equalling the pappus. Scales ovate, acute or obtuse, the terminal half bright purple, the outer successively shorter, thick. Receptacle minutely fimbrillate. Sterile flowers only seen, the corollas nearly equalling the pappus.

"Four feet high. La Paz, 11,500 ft., Aug. 18, 1901" (*No. 2301*).

Baccharis laxiflora sp. nov.

Puberulent; branches elongated, strongly ascending; leaves sessile, 2.5–4 cm. long, 5–7 mm. broad, linear, finely and sharply serrate, thickish, the midrib impressed above, very prominent underneath, the venation obscure; upper surface nearly glabrous, the fine veins purplish, the lower surface tomentose; panicles loose, few-flowered, broad, the heads on long slender peduncles which are naked or very sparsely linear-bracted, finely nerved, slightly enlarged above; involucre 6 mm. long, broadly campanulate, a few linear bracts at the base, the scales 5-nerved, purple, lanceolate, obtuse, several serialled; akene oblong, sharply 5-angled, smooth, light-brown, one-third the length of the pappus; corolla filiform, two-thirds the length of the apparently 1-serialled pappus, puberulent; style-branches reaching the end of the pappus, about as long as the united portion of the style, which is exserted, terete, the ends recurved; staminate flowers not seen.

"Two ft. high; La Paz, 11,500 ft., Aug. 16, 1901" (*No. 1675*).

Baccharis papillosa sp. nov.

Minutely puberulent; much branched, the branches purple, stout, costate, the branchlets short, leafy at the ends, the heads partly concealed among the leaves; petioles extremely short, broad, carinate; blades 10–15 mm. long and broad, obovate with cuneate base, obtuse, entire or above angularly and bluntly 2–4-

toothed, very thick, pale-green, coarsely papillose on both sides, the midrib very broad and stout beneath, the venation obsure; heads (sterile only seen) 5–6 mm. long, broad; involucre broadly campanulate, the scales about 5-serialled, the outer successively shorter and relatively broader, very thick, ovate to lanceolate, obtuse or acutish; corollas 5 mm. long, shorter than the coarse, wavy pappus, infundibular, papillose, the lobes one-third the length of the tube, linear-oblong, revolute; style-branches stout, puberulent, erect and appressed.

"Fifteen ft. high; La Paz, 11,500 ft., Aug. 23, 1901" (*No. 2347*).

Species near *B. subopposita*.

Baccharis Conwayi sp. nov.

Finely grayish-tomentellate. Branches erect, stoutish, densely leafy, the short branchlets densely flowered. Leaves sessile, 2–5 cm. long, 4–8 mm. broad, lance-linear, acuminate at both ends, acute, lightly, or many obsoletely, serrate. Heads in large and very dense masses, 3 or 4 mm. long and about a half broader, the hemispherical involucres about two-thirds their length, the scales lanceolate, acuminate and acute, thickish, the middle portion green, the rest yellowish-white, the margin lacerate, the outer a little smaller. Akene about one-fifth the length of the pappus, the style-branches about equalling the 1-serialled pappus. Akenes light-brown, glabrous, compressed, curved, nearly as broad as long, the ribs obscure. Receptacle convex, slightly foveolate and fimbrillate. Sterile flowers not seen.

Description taken from *Rusby's No. 1727* from Unduavi, 8000 ft., Oct. 1885, which is the type.

"La Paz, 11,500 ft. alt., Aug. 22, 1901" (*No. 2346*). The leaves a little narrower, the heads slightly smaller and less densely massed than in the type.

Franseria Conwayi sp. nov.

Finely tomentellate, especially the lower leaf-surfaces. Stems stout, strongly many-ribbed, bearing short, stout, densely leafy branchlets. Leaves 4–8 cm. long, 2–5 cm. broad, on short, narrowly margined petioles, thin, green above, grayish beneath, pinnately lobed, the principal lobes 2 pairs, which are continuous with small intermediate ones, and are themselves several-lobed, mostly on the lower margin, the ultimate lobes broadly ovate and acute, the extremely finely reticulate venation sharply impressed above, lightly prominent beneath. Flowers not seen. Fruits blackish-brown, 7–10 mm. long and one-half to two-thirds as broad, oblong or oval, short-pointed at each end, the spines about 3-serialled, with attenuate, incurved points.

"Santa Cruz, 5000 ft. alt., Aug. 25, 1902. Alta misa" (*No. 1464*).

Franseria recurva sp. nov.

Scabrous throughout, the leaves minutely, the deep-purple branches strongly so. Branchlets elongated, stoutish, erect or strongly ascending, densely leafy. Leaves nearly sessile, strongly recurved, 12–25 mm. long, 6–15 mm. broad, triangular-ovate in outline, pinnately dissected into 5–10 pairs of lobes, the largest of which are again divided, the ultimate segments sub-terete by involution, more or less channelled on the upper surface, obtuse. Racemes small, dense, terminating the branchlets. Involucres of the staminate heads 4 or 5 mm. broad, gray-green, about 8-lobed, the lobes triangular, acute, narrower than the acute triangular sinuses, about two-thirds as long as the contained flowers. Immature akenes ovoid, bearing many series of spines, which are attenuate with strongly incurved pungent tips, vertically flattened and concave at the base on the upper surface.

"Arequipa, 7500 ft. alt., Aug. 8, 1901" (*No. 2527*).

Encelia pilocarpa sp. nov.

Finely gray tomentellate throughout, the stems much-branched, the branches spreading, sharply angled, the leaves alternate, the basal ones not seen. Petioles 4–8 mm. long, slender, the blades 2–4 cm. long, 8–20 mm. wide, ovate, obtuse, entire, 3-nerved, the venation obscure. Peduncles long and slender, the heads 10–14 mm. high, the involucres two-thirds the length and 14–18 mm. wide, as pressed, the scales about 3-serialled, the outer somewhat shorter, loose, linear-lanceolate, obtuse, gray-green. Rays very pale, about a half longer than the disk-florets, which are 4 or 5 mm. long, the tube nearly half as long as the limb, the lobes ovate. Akenes 4–6 mm. long, about half as wide, obovate, densely long-pilose, strongly emarginate, destitute of setae.

"Two feet high. Arequipa, Peru, 7500 ft. alt., Aug. 8, 1901" (*No. 2526*).

Bidens longipetiolata sp. nov.

Leaves grayish-puberulent, more so underneath, otherwise glabrous. Branchlets numerous, slender, widely spreading or recurved, strongly costate, purplish. Petioles 1–4 cm. long, sub-margined above; blades 4–8 cm. long, 1.5–4 cm. broad, ovate, acute, the rounded base abruptly and shortly produced into the petiole, finely crenate-serrate, the slender secondaries about 8 or 10 on a side, strongly upcurved, the venation inconspicuous. Peduncles solitary in the axils, elongated, very slender, often with one or two subulate bracts. Heads about 1 cm. long, exclusive of the rays, and a little broader, as pressed. Outer scales of the involucre about as long as the inner, foliaceous, oblong-linear, mostly obtuse, bearing 3 or 5 bright purple nerves; inner scales rigid, lanceolate, mostly obtuse, purple-brown, the whitish margins minutely lacerate or erose. Rays about 15 mm. long, obovate,

sub-entire, yellow, with 9 strong purple nerves. Disk corollas narrowly infundibular, strongly purple-nerved, the lobes short, triangular-ovate, exceeding the pappus. Mature akenes not seen.

"Six feet high. Mychariapa, 3800 ft. alt., Apr. 9, 1902" (*No. 194*).

Calea lanceolata sp. nov.

Very scabrous throughout; branchlets slender, elongated, terete, striate; leaves opposite, the petioles 6–12 mm. long, connected by a narrow, thick line, the blades 5–12 cm. long, 12–35 mm. broad, lanceolate, acute, obtuse at the base, obsoletely serrate with minute salient teeth, the margin lightly revolute, thick, the midrib white-pilose beneath, where the yellowish venation is very prominent and coarsely reticulate, the secondaries, of very irregular number, strongly ascending and connecting close to the margin; corymb ample with elongated, more or less leafy branches, the few heads rather closely connected at the ends of the branchlets; peduncles 10–15 mm. long, erect; involucres 8–10 mm. broad, and not so long, hemispherical-campanulate, the scales rather few, the outer ovate, obtuse, appressed, with recurved foliaceous tips, cilate, thick, the midrib strong and dark, the nerves lighter, the inner successively narrower, longer, and straighter, without foliaceous tips; rays projecting 10–12 mm. beyond the involucre, about 3 mm. broad, entire or nearly so, strongly nerved; scales 6 mm. long, equalling the disk-corollas, strongly complanate and white-carinate, obtuse, entire; disk-corollas 4–5 mm. long, infundibular, the teeth triangular-ovate, obtuse, less than 1 mm. long and broad; anthers stout, 3 mm. long, slightly exserted; disk-akenes at maturity 4–5 mm. long, oblanceolate, lightly strigose, narrowly winged, the wing ciliate-serrate; pappus connate, the shorter bristles about 1 mm. long, the longest nearly as long as the akene, the opposite one about two-thirds as long.

"Twenty ft. high and two and one-half inches in diameter; Apolo, 4800 ft., July 9, 1902" (*No. 1408*).

The same as *Rusby's No. 2138*.

Calea brevifolia sp. nov.

Very scabrous; stems erect-branched, the branches elongated, slender; petioles 3 mm. long, very broad; blades 2–4 cm. long, 12–25 mm. wide, ovate, obtusish, truncate to slightly cordate at the base, crenate, thick, yellowish-gray-green, 3–5-nerved from the base, the venation impressed above, prominent underneath; inflorescence forming a narrow, leafy panicle, the corymbs very dense, mostly 1–2 cm. broad, on peduncles about 6 cm. long; heads sub-sessile, mostly with one or more small herbaceous bracts at the base, the involucre about 5 mm. long, 3 mm. broad, campanulate, the lowest scales only one-third the length of the inner, some of them with very slight herbaceous tips; tubular flowers

exceeding the involucre by about 3 mm.; rays wanting; scales of the receptacle 5 mm. long, equalling the tube of the corolla, moderately compressed, strongly 3-nerved, the nerves broad, yellow, the margin strongly setaceous-serrate; paleae of the pappus about 15, sub-equal, linear attenuate, finely serrate, nearly equalling the flowers; corolla-tube abruptly expanded at the summit, the lobes linear, recurved, nearly as long as the tube; anthers about equalling the corolla-lobes; styles about equalling the anthers, recurved; akene 1.5 mm. long, obconic, angled, rough-pilose.

"Apolo, 5000 ft., Apr. 9, 1902" (*No. 263*).

The same as *Holton's No. 348*.

Species very near *C. Ottonis* Schultes, but has much longer heads and less heavy venation, and the upper leaf-surfaces are much more scabrous.

Tagetes erythrocephala sp. nov.

Glabrous; stems 4–10 cm. high, the branches elongated; slender, diverging widely, then ascending, purplish, coarsely angled; leaves almost sessile, the base dilated and slightly clasping, 6–10 mm. long, pinnate, the 5–9 leaflets 1.5–4 mm. long, narrowly linear, thick, the larger bearing one or more short stubby teeth; divisions of some of the upper leaves, amidst the inflorescence, flat and somewhat broader, oblong or oblong-ovate; heads crowded, deep bright-purple, erect on slender peduncles 4–8 mm. long; involucres without basal scale, 8–12 mm. long, about 3 mm. wide at the broadest part, which is one-third of the distance from base to summit, cylindraceous-infundibular, obscurely many-nerved, the five lobes nearly erect, triangular-ovate, scarcely 1 mm. long and somewhat broader, mostly obtuse, the flowers not, or very slightly exserted; corolla of the disk-flowers 4 mm. long, very slender, cylindrical below, narrowly infundibular above, greenish-white, the limb abruptly purple, the lobes very small, triangular-ovate; pappus white, about equalling the corolla, one scale flat, linear or oblanceolate, the margin serrate with long slender teeth, the others aristiform, finely serrate; akene longer than the corolla, black, slender, tapering gradually at the base, sharply angled, white-strigose.

"Juliaca, Peru, 12,500 ft., May 15, 1902" (*No. 2512*). The same collected by Pearce at 11,000 ft., and by Matthews in Peru.

Senecio yurensis sp. nov.

Glabrous and very pale; much branched, the branches long and very slender, finely many-nerved; leaves narrowly linear, 12–25 mm. long, acute, fleshy, mostly recurved; inflorescence sparse and very loose, the heads solitary on peduncle-like branchlets which are 12–25 mm. long, and bear minute filiform bract-like leaves;

heads 8–10 mm. long, the rays about 5 mm. longer; involucre reddish-purple at the base, campanulate, not quite equalling the pappus, the scales equal, narrowly lanceolate, long-acuminate and acute, apparently fleshy; rays strongly 4-nerved, lightly 3-toothed; disk-flowers slightly exceeding the pappus, infundibular, strongly nerved, plicate or ribbed above, the lobes short, ovate, obtuse; akene short and broad, densely white-pilose, those in a young state only seen; anthers separate, half the length of the corolla, slightly broadened upward, the base entire; style-branches long, terete, the summit white-penicillate, the hairs short, forming a circular band.

Yura, Peru, 8400 ft., Aug. 10, 1901 (*No. 2565*). *No. 2533*, from Arequipa, Peru, 7500 ft., Aug. 8, 1901, is the same, but a less slender, more contracted form, apparently from an arid locality.

Senecio Williamsii sp. nov.

Gray-tomentellate, the upper leaf-surfaces strigose; stems erect, stout, purple, very leafy; petioles about 12 mm. long, very stout, channelled; leaves 10–15 cm. long, 18–30 mm. broad, oval-ovate, acuminate at both ends, coarsely serrate, the lower third entire, thick, the upper surface dark-green, very scabrous, the lower surface gray or yellowish, the 10–12 pairs of strongly ascending secondaries prominent beneath; panicle short and broad, either small (8–12 cm. broad) or, by the union of many such, on long peduncles in the upper leaf-like bracts, becoming a large, compound panicle, the heads rather densely massed; peduncles mostly 10–20 mm. long, linear-bracted; heads about 15 mm. long, exclusive of the rays, which are 6 mm. longer; involucre double, the outer of several linear, foliaceous bracts, the inner of lanceolate or slightly oblanceolate, acuminate bracts, the middle portions dark, the margins yellowish; rays with 5 strong nerves and some lesser ones, entire or minutely toothed; tubular corollas slightly exceeding the pappus, regularly infundibular, the lobes oblong, obtuse, about one-sixth the total length; anther-tube 3 mm. long, slightly enlarged above, the anthers slightly appendaged at the base, the terminal appendages large; style branches very slightly penicellate; akenes linear, sharply 10-nerved.

"Six ft. high; Santa Cruz, 5000 ft., Aug. 24, 1902" (*No. 1460*). The same collected by Pearce.

Trixis diffusa sp. nov.

Ferruginous-pubescent, the lower leaf-surfaces tomentose, the branchlets elongated, slender, striate, divaricate or widely spreading. Leaves 5–12 cm. long, 15–35 mm. broad, lanceolate, acuminate and acute, narrowed into a short, margined, petiole-like base, which is slightly auriculate-clasping; entire, thin, roughish-strigose

above, tomentose beneath. Inflorescence ample, usually dense, subulate-bracted, the peduncles slender, short or elongated, strongly striate. Heads 12–14 mm. long and nearly as broad, as pressed, the involucre broadly turbinate, two-thirds or three-fourths the length of the head, the scales green, lanceolate, acuminate, carinate toward the base, the outer smaller, the outermost narrow and sub-herbaceous. Receptacle fimbriate. Akene about 6 mm. long, a little shorter than the pale-brown pappus, linear, somewhat narrowed at the base and summit and terminating in a nearly flat disk, obscurely costate, sparsely papillose.

"Apolo, 4800 ft. alt., March 12, 1902 (*No. 75*) and Apr. 5, 1902 (*No. 139*)." These two are identical. *Bang's No. 1493* from Mapiri, published as *T. divaricata* Spr., has more numerous and slightly smaller heads, but is of the same species.

Hieracium apoloensis sp. nov.

Inflorescence and upper portions minutely short-pilose, the hairs divaricate, those of the involucre black. Stems erect, very slender, simple or nearly so, 20–50 cm. high, ribbed. Radical leaves mostly erect, 4–15 cm. long, including the very slender petioles, which are longer than the blades and pass imperceptibly into them, the blades linear-oblanceolate, acutish, entire, attenuate at the base, the very slender, crooked secondaries erect, the venation obscure. Cauline leaves one or two, the upper reduced to elongated-linear or sub-filiform bracts. Inflorescence nude or nearly so, loosely corymbose or reduced to few or a single head, the peduncles very slender. Involucre 6 or 7 mm. long, and about equalling the pappus, campanulate, the scales narrowly lanceolate, acuminate, the outer successively shorter. Rays a half or more longer than the pappus, which is fragile and brownish. Akenes small, immature in the specimen described.

"Hills near Apolo, 6000 ft. alt., Feb. 20, 1902" (*No. 130*). *No. 1466*, from the same place, Aug. 31, 1902, is a smaller form of the same.

The Polyporaceae of Mexico

By William A. Murrill

The polypores of Mexico were known to Fries chiefly through the collections of Liebmann, who, however, made no specialty of this group of plants. The Ellis Collection at the New York Botanical Garden contains a number of Mexican specimens collected by Charles L. Smith in 1891–92. The private herbarium of Dr. N. Patouillard at Paris contains a small collection of polypores sent to him from Mexico by Paul Maury about fifteen years ago. In addition to the foregoing, a few specimens have been picked up from time to time by collectors of flowering plants and by other explorers, and these are scattered through various herbaria.

The list given below, comprising all the species of Polyporaceae known to occur in Mexico, with the exception of a few white or bright-colored resupinate forms, is prepared chiefly from my own collections there in 1909 and 1910, and all the numbers cited are my own. Species not found by me are listed in their proper order, the collectors' names being given. The few species that are still insufficiently known are termed doubtful, and listed under the old genera as published.

Localities and Dates of the Author's Collections

1. Moist virgin forest at Jalapa, 5000 ft. December 12–20, 1909.
2. Gardens and barrancas in and near Cuernavaca, 5000 ft., dry season. December 24–27, 1909.
3. Moist virgin forest along the Tepeite River, near Cuernavaca, 7000 ft. December 28, 1909.
4. Dense jungle along Armerica River, near Tecoman, 200–500 ft., dry season. January 2, 1910.
5. Orchards and barrancas in and near Colima, 1600 ft., dry season. January 3–4, 1910.
6. Moist virgin forests and coffee plantations at Rio Blanco, Rincon Grande, and El Barrio Nuevo, Orizaba, 4000 ft. January 10–14, 1910.
7. Moist virgin forest on mountain side, at Motzorongo, near Cordoba, 800–1500 ft. January 15, 1910.
8. Moist lowlands, mostly coffee plantations with much dead wood, along Rio Blanco, near Xuchiles, south of Cordoba, 1500–2000 ft. January 17, 1910.

Tribe PORIEAE

FOMITIPORIA OBLIQUIFORMIS Murrill, N. Am. Flora **9**: 9. 1907.
Cuernavaca, *382*.

FUSCOPORELLA MEXICANA Murrill, N. Am. Flora **9**: 7. 1907.
Type collected in Mexico by C. L. Smith.

FUSCOPORIA CARBONARIA (Berk. & Curt.) Murrill, N. Am. Flora **9**: 4. 1907.
Tepeite Valley, *571*.

FUSCOPORIA FERRUGINOSA (Schrad.) Murrill, N. Am. Flora **9**: 5. 1907.
Jalapa, *113*, *250;* Tecoman, *691*.

TINCTOPORIA AURANTIOTINGENS (Ellis & Macbr.) Murrill, N. Am. Flora **9**: 14. 1907. Type from Mexico.
Jalapa, *224*.

Tribe POLYPOREAE

ABORTIPORUS TROPICALIS Murrill, Mycologia **2**: 185. 1910. Described from Hope Gardens, Jamaica.
Jalapa, *217*.

BJERKANDERA ADUSTA (Willd.) Karst. Medd. Soc. Faun. Fl. Fenn. **5**: 38. 1879.
Jalapa, *50*, *315;* Tepeite Valley, *557*, *565;* Orizaba, *839*, *866*, *870;* Xuchiles, *1194*.

CERIOMYCES MEXICANUS de Seynes, Bull. Soc. Myc. Fr. **6**: 102. 1890. An abnormal plant resembling certain species of *Funalia*.

CERRENELLA FARINACEA (Fries) Murrill, N. Am. Flora **9**: 74. 1908.
Jalapa, *231;* Orizaba, *840*, *856;* Xuchiles, *1192*.

COLTRICIA SPATHULATA (Hook.) Murrill, N. Am. Flora **9**: 93. 1908.
Collected at Jalapa, Mexico, by C. L. Smith.

CORIOLELLUS SEPIUM (Berk.) Murrill, Bull. Torrey Club **32**: 481. 1905.
Cuernavaca, *381;* Orizaba, *874*.

? CORIOLELLUS SERIALIS (Fries) Murrill, N. Am. Flora **9**: 29. 1907. Sterile or otherwise not positively identifiable.
Orizaba *872;* Motzorongo, *1030*.

CORIOLOPSIS CAPERATA (Berk.) Murrill, N. Am. Flora **9**: 77. 1908.
Tecoman, *638;* Xuchiles, *1191*.

Coriolopsis caperatiformis sp. nov.

Pileus slightly flexible to rigid, dimidiate, broadly attached, decurrent, applanate or slightly convex, 2.5–3.5 × 4–6 × 0.2–0.7 cm.; surface shaggy with coarse, fulvous-bay hairs 5 mm. in length, which gradually wear away with age and allow the fulvous or bay, zonate-sulcate surface to appear; margin undulate or lobed, thin, hairy to finely tomentose; context thin, firm, almost woody, fulvous; tubes 1.5–2.5 mm. long, avellaneous-umbrinous within; mouths circular or irregular, not angular, 3–5 to a mm.; edges rather thick, firm, entire, avellaneous to umbrinous.

Collected on dead wood in a moist virgin forest near Motzorongo, Mexico, January 15, 1910, *W. A. & Edna L. Murrill 982, 1017 (type), 1048.*

CORIOLOPSIS CROCATA (Fries) Murrill, Bull. Torrey Club **32**: 358. 1905. Type from Mexico.

Motzorongo, *963, 967;* Xuchiles, *1173, 1175.*

Coriolopsis crocatiformis sp. nov.

Pileus coriaceous, flaccid, flexible, elastic, effused-reflexed, subimbricate, more or less laterally connate, the reflexed portion dimidiate or laterally elongate, conchate, 1.5–2 × 3–7 × 0.2–0.5 cm.; surface very irregular and uneven, tomentose to spongy, somewhat sulcate, fulvous; context very thin, punky, fulvous; tubes 3–5 mm. long, grayish-fulvous within; mouths large, angular, somewhat irregular, 2 to a mm., glistening, fulvous-umbrinous; edges thin, flexible, entire or slightly toothed; spores subglobose, smooth, hyaline, 3.5μ; cystidia none.

Type collected on dead wood near Oaxaca, Mexico, February 22, 1910, *C. R. Orcutt.*

Coriolopsis fumosa sp. nov.

Pileus small, thin, slightly flexible, somewhat bell-shaped, attached by the vertex to the under side of a dead branch, laterally connate, 0.7 × 1.3 × 0.1–0.2 cm.; surface tomentose, narrowly concentrically zonate-sulcate, fulvous to bay, margin thin, undulate, fumosous beneath on drying; context fulvous, soft and spongy above, with a rather firm fibrous layer next to the tubes; hymenium dark-fumosous-umbrinous; tubes less than 1 mm. long, murinous within, firm; mouths regular, angular, very minute, 8–10 to a mm.; edges very thin, entire.

Type collected on dead wood in a moist virgin forest near Jalapa, Mexico, December 12–20, 1909, *W. A. & Edna L. Murrill 312.*

CORIOLOPSIS OCCIDENTALIS (Kl.) Murrill, Bull. Torrey Club **32**: 358. 1905.

Colima, *585;* Orizaba, *863.*

CORIOLOPSIS RIGIDA (Berk. & Mont.) Murrill, N. Am. Flora **9**: 75. 1908.

Jalapa, *228*, *251;* Cuernavaca, *374;* Colima, *576*, *593;* Tecoman, *620*, *624*, *636;* Orizaba, *865;* Motzorongo, *977*, *999*, *1000*, *1036*.

Coriolopsis sarcitiformis sp. nov.

Pileus thin, imbricate, dimidiate or flabelliform, applanate, usually several times lobed, narrowly attached, sessile, of light weight, 4–6 × 5–8 × 0.5–0.7 cm.; surface slightly zonate at times, uneven, conspicuously adorned with dense, fulvous fibers arranged in a radiating manner and appearing as though originating from the tearing of the cuticle, these fibers gradually wearing away with age, leaving the surface still more uneven and from dark-fulvous to chestnut in color; margin usually rather deeply and many times lobed, thin, yellow below when young; context punky, ochraceous-ferruginous, varying in thickness from 1 to 3 mm.; tubes reaching 4 mm. in length, pale-avellaneous within, corky; mouths minute, circular, 3–5 to a mm., flavo-melleous when young, becoming avellaneous or umbrinous and finally chestnut with age, glistening; edges uneven, rather thick at first, thin and lacerate with age; cystidia fulvous, ventricose at the base, tapering to a point, rather abundant, 20–40 × 5–7μ.

Collected three or four times in abundance on fallen dead trunks in a moist virgin forest in the Tepeite Valley, near Cuernavaca, Mexico, 7000 ft. elevation, December 28, 1910, *W. A. & Edna L. Murrill 555* (*type*), *567*. This interesting species has the habit of *Hapalopilus gilvus* and a surface covering similar to that of *Pyropolyporus sarcitus*. It is strictly annual and of light weight. No very near relative is known.

CORIOLOPSIS VITTATA (Ellis & Macbr.) Murrill, N. Am. Flora **9**: 76. 1908. Poor, indurated specimens with very small tubes.

Tecoman, *629*.

CORIOLUS ABIETINUS (Dicks.) Quél. Ench. Fung. 175. 1886. Collected on Mt. Orizaba at 11000 ft. elevation by Jared G. Smith in 1892, and probably common on conifers at high elevations throughout the republic.

CORIOLUS BRACHYPUS (Lév.) Murrill, Bull. Torrey Club **32**: 646. 1906.

Tecoman, *619*.

Coriolus concavus sp. nov.

Pileus deeply concave, scutate-conchate, narrowly or rather broadly attached behind or by the vertex, rather thick, subrigid when dry but of corky texture, subimbricate, 2 × 3–5 × 0.2–0.8

cm.; surface finely tomentose, white, irregular, slightly once or twice sulcate, margin rather thick, entire or lobed, concolorous, not inflexed on drying; context punky, white; tubes rather long for the genus, reaching 3–4 mm., at first white, changing to cremeous; mouths irregular, angular, large, 2 to a mm.; edges thin, uneven to slightly dentate.

Type collected on dead wood in a moist forest near Orizaba, Mexico, 4000 ft. elevation, January 10–14, 1910, *W. A. & Edna L. Murrill 838.*

CORIOLUS CYPHELLOIDES (Fries) Murrill, N. Am. Flora **9**: 26. 1907. Type collected at Huatano, Mexico, by Liebmann.

CORIOLUS HOLLICKII Murrill, Mycologia **2**: 187. 1910. Described from Union Hill, Jamaica.

Jalapa, *44, 44½, 149, 247.*

Coriolus irpiciformis sp. nov.

Pileus white throughout or slightly greenish behind, probably owing to algae, gregarious, elongate-spatulate, narrowly or broadly attached, 4–7 × 2.5–4 × 0.2 cm.; surface slightly zonate, minutely fibrose-lacerate, margin lacerate, fertile; context very thin, fibrous; tubes about 2 mm. long; mouths large, angular, soon becoming irpiciform; edges acute, separating into irregular, toothed plates.

Type collected on dead chips in moist woods near Orizaba, Mexico, 4000 ft. elevation, January 10–14, 1910, *W. A. & Edna L. Murrill 876.*

CORIOLUS MAXIMUS (Mont.) Murrill, Bull. Torrey Club **34**: 467. 1907.

Motzorongo, *966, 984;* Xuchiles, *1174.*

CORIOLUS MEMBRANACEUS (Sw.) Pat. Tax. Hymén. 94. 1900.

Jalapa, *202;* Motzorongo, *1003;* Xuchiles, *1178.*

CORIOLUS NIGROMARGINATUS (Schw.) Murrill, Bull. Torrey Club **32**: 649. 1906.

Orizaba, *861.*

Coriolus orizabensis sp. nov.

Pileus many times imbricate, very slightly decurrent at times, sessile, dimidiate or fan-shaped, conchate, thin, flexible, 2–3 × 3–5 × 0.2–0.3 cm.; surface white to slightly yellowish-discolored, uneven, rugose, two or three times slightly sulcate, obscurely zonate, appressed-fibrillose, margin undulate, somewhat abruptly thickened, finely tomentose, conspicuously appressed-fibrillose, subconcolorous; context white, fibrous, 1 mm. thick; tubes 2 mm. long, pallid within; mouths large, irregular, glistening, white to discolored, 2 to a mm. near the margin, 1 to a mm. behind; edges thin, lacerate-dentate.

Type collected on dead wood in moist woods near Orizaba, Mexico, 4000 ft. elevation, January 10–14, 1910, *W. A. & Edna L. Murrill 867*. Related to *C. biformis*. What appears to be a thicker form of this species was collected on a dead oak log in the Tepeite Valley, near Cuernavaca, Mexico, 7000 ft. elevation, December 28, 1909, *W. A. & Edna L. Murrill 560.*

CORIOLUS PAVONIUS (Hook.) Murrill, N. Am. Flora **9**: 25. 1907.

Orizaba, *847*, *884*.

CORIOLUS PINSITUS (Fries) Pat. Tax. Hymén. 94. 1900.

Jalapa, *227;* Cuernavaca, *365*, *375;* Orizaba, *877*, *883;* Motzorongo, *1021*.

CORIOLUS PROLIFICANS (Fries) Murrill, N. Am. Flora **9**: 27. 1907.

This species was formerly collected at Jalapa and described as *Polyporus xalapensis*.

Jalapa, *40*, *122*.

CORIOLUS SCUTATUS Murrill, N. Am. Flora **9**: 25. 1907. Type collected in Mexico by C. L. Smith.

CORIOLUS SECTOR (Ehrenb.) Pat. Tax. Hymén. 94. 1900.

Jalapa, *219;* Xuchiles, *1184*.

Coriolus subpavonius sp. nov.

Pileus rather thin, coriaceous, slightly flexible when young, becoming rigid, especially on reviving the second season, dimidiate or flabelliform, subimbricate, applanate or slightly conchate, 2–3 × 2–3 × 0.1–0.3 cm.; surface broadly zonate, finely tomentose to subglabrous in zones, pallid or cremeous, becoming bay or olive with age in zones or behind, margin thin, undulate or lobed, pallid; context white, fibrous, firm, 1 mm. thick; tubes punctiform, very short at first, later becoming 1 mm. or more long, white to stramineous within and without; mouths glistening, very regular, circular, minute, 8–10 to a mm.; edges rather thick, firm, entire.

Type collected on dead wood in a moist virgin forest near Jalapa, Mexico, December 12–20, 1909, *W. A. & Edna L. Murrill 223*. Similar to *C. pavonius*, but rigid and with much smaller tubes.

Coriolus tepeitensis sp. nov.

Pileus mostly resupinate, subcircular to irregular, the margin detached from the substratum and slightly elevated at times, the reflexed portion, which is usually present, narrow, conchate, thin, flexible, reaching 6 mm. in length and 1–2 cm. in width; surface irregularly and narrowly sulcate-zonate, subglabrous, uneven, varying from pallid to ochraceous or pale-avellaneous; context thin, whitish, punky; tubes white within, 1–2 mm. long; mouths

very regular, 5–6 to a mm., stramineous, subcircular, corky, glistening; edges entire, at first thick, becoming thinner with age.

Collected on dead fallen branches in the Tepeite Valley, near Cuernavaca, Mexico, 7000 ft. elevation, December 28, 1909, *W. A. & Edna L. Murrill 490, 533, 550* (*type*).

CORIOLUS VERSICOLOR (L.) Quél. Ench. Fung. 175. 1886. The form of this species usually found in tropical America is of an azure tint, and was described by Fries as *Polyporus azureus*.

Jalapa, *222, 229;* Cuernavaca, *563;* Orizaba, *855*.

Coriolus xuchilensis sp. nov.

Pileus semiresupinate, imbricate, inconspicuous, the reflexed portion conchate, rather thin, 3–5 × 7–10 × 0.1–0.2 mm.; surface azonate, silky or pubescent, very pale fulvous fading to pallid on drying, margin undulate, acute, inflexed and slightly discolored on drying; context soft-fibrous, thick behind, very thin in front, pallid; tubes about 1 mm. long, dull-whitish within and without; mouths angular, somewhat irregular, 3–5 to a mm.; edges thin, entire, glistening.

Type collected on a dead trunk in a coffee plantation at Xuchiles, near Cordoba, Mexico, January 17, 1910, *W. A. & Edna L. Murrill 1171*. Somewhat similar to *C. pallidofulvellus*.

CYCLOPORELLUS IODINUS (Mont.) Murrill, N. Am. Flora **9**: 85. 1908. Jalapa, *213, 218, 236, 249*.

EARLIELLA CORRUGATA (Pers.) Murrill, Bull. Torrey Club **34**: 468. 1907.

Colima, *595*.

FAVOLUS LEPROSUS (Fries) Murrill, N. Am. Flora **9**: 83. 1908. Several excellent specimens of this very rare polypore were obtained. The appearance of the upper surface is suggestive of *Hapalopilus rutilans*, but the large, ochraceous tubes, which become reddish-fulvous when bruised, at once separate it very distinctly from that species.

Orizaba, *880*.

Favolus tenuiformis sp. nov.

Pileus very thin, coriaceous, flexible, fan-shaped, applanate, narrowly attached, 2 × 2.5 × 0.1–0.2 cm.; surface glabrous, shining, zonate, slightly radiate-rugose, umbrinous to pale-chestnut, margin very thin, entire, concolorous; context light-fulvous, membranous, as thin as paper; tubes less than 1 mm. long, avellaneous-umbrinous within; mouths circular, irregular, 6 to a mm.; edges fuliginous, at first thick, becoming rather thin, firm, entire.

Type collected on dead wood in a dense jungle at Tecoman

near Colima, Mexico, January 2, 1910, *W. A. & Edna L. Murrill 653*. This species resembles *Favolus tenuis*, but has much smaller tubes, the mouths being invisible to the unaided eye.

FAVOLUS TENUIS (Hook.) Murrill, Bull. Torrey Club **32**: 100. 1905.

Jalapa, *220*, *226;* Motzorongo, *969;* Xuchiles, *1186*.

FAVOLUS VARIEGATUS (Berk.) Murrill, Bull. Torrey Club **32**: 101. 1905.

Tecoman, *655*.

FLAVOPORELLUS SPLITGERBERI (Mont.) Murrill, Bull. Torrey Club **32**: 486. 1905. Collected in Mexico by Liebmann and described by Fries as *Polyporus sulfuratus*.

FLAVIPORUS RUFOFLAVUS (Berk. & Curt.) Murrill, Bull. Torrey Club **32**: 360. 1905. Collected at Jalapa by C. L. Smith.

FUNALIA VILLOSA (Sw.) Murrill, Bull. Torrey Club **32**: 356. 1905.

Tecoman, *644;* Orizaba, *772*.

Grifola lentifrondosa sp. nov.

Pileus imbricate-multiplex, 15–20 × 20–30 cm.; pileoli mostly spatulate, closely appressed and more or less connate; surface isabelline with a rosy tint, subtomentose, becoming fuliginous with age, margin entire or undulate, sterile, inflexed on drying; context white, radiate-fibrous, separating into tough strings like that of bast-tissue; tubes pallid to light-brown, minute, thin-walled, 2–3 mm. long; mouths angular; edges thin, lacerate with age; spores globose, smooth, hyaline, copious, 3–4μ; stipe tubercular, woody, pallid, expanding into the pileoli, 8 cm. long, 6 cm. thick.

Type collected on the roots of an oak stump on an exposed railway embankment near Jalapa, Mexico, December 12–20, 1909, *W. A. & Edna L. Murrill 56*. The species much resembles *Grifola frondosa* in general form, but the context is much too woody for that or any other known species of *Grifola*.

HAPALOPILUS GILVUS (Schw.) Murrill, Bull. Torrey Club **31**: 418. 1904.

Jalapa, *36*, *208*, *215*, *216*, *225;* Cuernavaca, *388;* Orizaba, *862*, *882;* Xuchiles, *1189*.

HAPALOPILUS LICNOIDES (Mont.) Murrill, Bull. Torrey Club **31**: 417. 1904. These specimens are very large and resemble some perennial species, the older pilei having persisted and partially revived, which is not an uncommon occurrence in this species.

Cuernavaca, *389;* Tecoman, *627*, *652*, *673;* Motzorongo, *970*, *975*, *1011*.

HEXAGONA DAEDALEA (Link) Murrill, Bull. Torrey Club **31**: 328. 1904. Collected in Mexico by C. L. Smith and also by Maury.

Hexagona daedaleiformis sp. nov.

Pileus fan-shaped to reniform, sometimes slightly attenuate behind, subapplanate, plane or concave below, long-stipitate, 2–3 × 3–4 × 0.1–0.2 cm.; surface pallid, pale-fulvous when dry, radiate-striate and finely areolate over most of the surface, minutely hispid; margin entire or undulate, thin, concolorous, inflexed in drying; context thin, white, fibrous; tubes pallid within, scarcely over 1 mm. deep, decurrent; mouths regular, pallid to isabelline, somewhat glistening, small, 0.5 mm. wide, 1 mm. or more long; edges very thin, soon becoming fimbriate; stipe lateral, concolorous or paler, glabrous, 1.5–2 cm. long, 2–3 mm. thick at the base, increasing to 5 or 6 mm. above, furrowed on the back, subcylindric below.

Type collected on dead wood in Mexico, *C. L. Smith*. This species was found among specimens of *Hexagona daedalea* collected by C. L. Smith in Mexico and numbered 6440. It may be readily distinguished by its much smaller tubes.

Hexagona motzorongensis sp. nov.

Pileus minute, thin, dimidiate, depressed above, convex below, attenuate behind, 2 cm. broad; surface pale-avellaneous-isabelline, becoming bay on drying, tessellate, minutely hispid-fibrillose; context thin, white, fragile; tubes white, of medium size for the genus, 1–2 mm. long, angular; edges thin, fimbriate, lacerate with age; stipe reduced, furrowed above, hispid-tomentose, pallid, 1–2 mm. long, 1 mm. thick.

Collected on dead wood in a moist virgin forest at Motzorongo, near Cordoba, Mexico, January 15, 1910, *W. A. & Edna L. Murrill 983 (type), 1002.*

HEXAGONA RENIFORMIS Murrill, N. Am. Flora **9**: 50. 1907. Described from southern Florida.

Motzorongo, *968, 1001, 1027, 1031.*

Hexagona sulfurea sp. nov.

Pileus sulfureous throughout, sessile or attached by a much reduced stipe, very irregular, usually fan-shaped, conchate, 1 × 1 × 0.1 cm.; surface smooth, glabrous, margin lobed and usually splitting deeply with age, much inflexed on drying; context thin, white, fibrous, fragile when dry; tubes shallow, angular, elongate, about 0.5–1 mm. broad, 1–2 mm. long; edges rather thick, entire or dentate.

Type collected on dead wood in a moist virgin forest at Motzorongo, near Cordoba, Mexico, January 15, 1910, *W. A. & Edna L. Murrill 1009.*

INONOTUS DRYADEUS (Fries) Murrill, N. Am. Flora **9**: 86. 1908. Reported by Patouillard in 1896 from Diguet's collections on oaks in Lower California. Specimens not seen.

INONOTUS PUSILLUS Murrill, Bull. Torrey Club **31**: 599. 1904. Type collected at Manzanillo, Mexico, by Dr. Edward Palmer in 1892.

IRPICIPORUS LACTEUS (Fries) Murrill, N. Am. Flora **9**: 15. 1907.
Orizaba, *858, 860;* Xuchiles, *1182.*

LAETIPORUS SPECIOSUS (Batt.) Murrill, Bull. Torrey Club **31**: 607. 1904. Collected in Mexico by C. L. Smith.

LEPTOPORUS MEXICANUS Pat. Bull. Soc. Myc. Fr. **14**: 55. 1898. Type from Mexico, collected by Maury on coniferous trunks. Not examined, but probably a species of *Tyromyces.*

MICROPORELLUS DEALBATUS (Berk. & Curt.) Murrill, Bull. Torrey Club **32**: 483. 1905.
Jalapa *55, 207;* Motzorongo, *965, 974, 1015.*

MICROPORELLUS UNGUICULARIS (Fries) Murrill, N. Am. Flora **9**: 53. 1907. Type collected in Mexico by Liebmann.

PHAEOLUS SISTOTREMOIDES (Alb. & Schw.) Murrill, Bull. Torrey Club **32**: 363. 1905. Collected in Mexico by C. L. Smith.

POGONOMYCES HYDNOIDES (Sw.) Murrill, Bull. Torrey Club **31**: 609. 1904.
Tecoman, *657;* Motzorongo, *1051.*

POLYPORUS ARCULARIUS (Batsch) Fries, Syst. Myc. **1**: 342. 1821.
Jalapa, *203, 239;* Orizaba, *849, 871.*

POLYPORUS BLANCHETIANUS Berk. & Mont. Ann. Sci. Nat. III. **11**: 238. 1839.
Jalapa, *240.*

POLYPORUS CUTICULARIS (Bull.) Fries, Syst. Myc. **1**: 363. 1821. Reported by Patouillard in 1896 from Diguet's collections in Lower California. Specimens not seen.

POLYPORUS DENDRITICUS Fries, Nova Acta Soc. Sci. Upsal. III. **1**: 53. 1851. A doubtful species described from Liebmann's collections in Mexico.

POLYPORUS DIABOLICUS Berk. Jour. Bot. & Kew Misc. **8**: 174. 1856.
Jalapa, *200.*

POLYPORUS ELEGANS (Bull.) Fries, Epicr. Myc. 440. 1838.
Jalapa, *235.*

POLYPORUS SUBELEGANS Murrill, N. Am. Flora **9**: 62. 1907.
Jalapa, *233, 237.*

POLYPORUS TRICHOLOMA Mont. Ann. Sci. Nat. II. **8**: 365. 1837. Cuernavaca, *357;* Colima, *598;* Motzorongo, *939, 971.*

POLYSTICTUS PLUMBOSUS Fries, Nova Acta Soc. Sci. Upsal. III. **1**: 93. 1851. Type collected in Mexico by Liebmann; now known only from the description.

PYCNOPORUS SANGUINEUS (L.) Murrill, Bull. Torrey Club **31**: 421. 1904.
Tecoman, *677;* Orizaba, *885;* Motzorongo, *1013.*

RIGIDOPORUS LIEBMANNI (Fries) Murrill, N. Am. Flora **9**: 46. 1907. Type collected at Mirador, Mexico, by Liebmann.

RIGIDOPORUS SUBSTEREINUS Murrill, N. Am. Flora **9**: 46. 1907.
Motzorongo, *972½*; Xuchiles, *1176, 1185.*

RIGIDOPORUS SURINAMENSIS (Miq.) Murrill, Bull. Torrey Club **34**: 473. 1907.
Motzorongo, *972;* Xuchiles, *1179.*

TOMOPHAGUS COLOSSUS (Fries) Murrill, Torreya **5**: 197. 1905. An immense species described from Costa Rica and also collected on *Cedrela* in Yucatan by Dr. C. F. Millspaugh.

TRAMETES CUBENSIS (Mont.) Sacc. Syll. Fung. **9**: 198. 1891.
Motzorongo, *1033, 1044.*

Trametes jalapensis sp. nov.

Pileus of medium size, dimidiate to flabelliform, sessile, corky, scarcely flexible, imbricate, 2–4 × 3–7 × 0.5–1 cm.; surface pelliculose, glabrous, azonate, smooth, avellaneous to blackish-avellaneous, margin acute or slightly obtuse, sterile, entire, concolorous; context punky, homogeneous, white with a faint yellowish or rosy tint, 3–7 mm. thick; tubes 2 mm. long, rigid, corky to woody, discolored-whitish within; mouths circular, 2–3 to a mm.; edges rather thick, entire or slightly dentate, pale-umbrinous.

Type collected on a railway tie near Jalapa, Mexico, December 12–20, 1909, *W. A. & Edna L. Murrill 210.*

TRAMETES MEXICANA Berk. & Curt. Jour. Linn. Soc. **9**: 423. 1867. A doubtful species described from Botteri's collections in Mexico.

Trametes rutilantiformis sp. nov.

Pileus thick, subtriangular in section, convex above and below, firm but of very light weight, dimidiate, rather broadly attached, 3 × 4 × 1 cm.; surface glabrous, slightly sulcate, uneven, with thin cuticle, fulvous tinted with chestnut, margin acute, entire, glabrous, ochraceous; context soft-corky, 2–3 mm. thick, ochraceous; tubes long, slender, ochraceous within, 3–10 mm. long; mouths subcircular, 4–5 to a mm.; edges somewhat glistening,

white or whitish, thin, entire, corky; spores oblong-ellipsoid, smooth, hyaline, 4–5 × 1.5–2 μ.

Type collected on dead wood in British Honduras in the winter of 1907, *Morton E. Peck.*

TRAMETES SUBMURINA Murrill, N. Am. Flora **9**: 43. 1907.

Tecoman, *643*.

TYROMYCES CAESIUS (Schrad.) Murrill, N. Am. Flora **9**: 34. 1907.

Tepeite Valley, *562*, *566*.

TYROMYCES LACTEUS (Fries) Murrill, N. Am. Flora **9**: 36. 1907.

Tepeite Valley, *556*.

TYROMYCES LEUCOMALLUS (Berk. & Curt.) Murrill, N. Am. Flora **9**: 36. 1907.

Xuchiles, *1183*.

TYROMYCES SEMIPILEATUS (Peck) Murrill, N. Am. Flora **9**: 35. 1907.

Tepeite Valley, *532*.

Tyromyces semisupiniformis sp. nov.

Pilei very abundant, imbricate, semiresupinate, the reflexed portion dimidiate or laterally extended, sometimes cuneate, convex above, slightly concave below, thin, very tough, 1–1.5 cm. long, about 1.5 cm. broad, larger by confluence, 1–3 mm. thick; surface slightly sulcate-zonate, dull-ochroleucous behind, stramineous in front, glabrous, somewhat uneven, margin thin, sterile, undulate or lobed; context very thin, white, rigid when dry, only slightly friable; tubes ochroleucous, cremeous near the margin; mouths very minute, invisible to the unaided eye, circular to angular; edges entire, obtuse, becoming thin.

Type collected on the side of a large log in a moist virgin forest near Jalapa, Mexico, 5000 ft. elevation, December 12–20, 1909, *W. A. & Edna L. Murrill 53*.

Tribe FOMITEAE

ELFVINGIA FASCIATA (Sw.) Murrill, Bull. Torrey Club **30**: 298. 1903. Collected at Tehuantepec by B. Shimek.

ELFVINGIA TORNATA (Pers.) Murrill, Bull. Torrey Club **30**: 301. 1903.

Jalapa, *100*, *211;* Tepeite Valley, *569;* Motzorongo, *1040*.

FOMES AUBERIANUS (Mont.) Murrill, Bull. Torrey Club **32**: 491. 1905.

Chapultepec Castle, *353;* Motzorongo, *964*, *1035*, *1050;* Xuchiles, *1193*.

FOMES ROSEUS (Alb. & Schw.) Cooke, Grevillea **14**: 21. 1885.
Jalapa, *41*, on railroad ties.
FOMES SAGRAEANUS (Mont.) Murrill, N. Am. Flora **9**: 96. 1908.
Cuernavaca, *360;* Tecoman, *661*.
FOMES SCUTELLATUS (Schw.) Cooke, Grevillea **14**: 19. 1885.
Jalapa, *221*, *232*.
FOMES UNGULATUS (Schaeff.) Sacc. Syll. Fung. **6**: 167. 1888.
Tepeite Valley, *554*.
FOMITELLA FUMOSO-AVELLANEA (Romell) Murrill, N. Am. Flora **9**: 101. 1908.
Tepeite Valley, *564;* Tecoman, *630*, *633*.
FOMITELLA SUPINA (Sw.) Murrill, Bull. Torrey Club **32**: 365. 1905.
Tecoman, *645*.

Ganoderma areolatum sp. nov.

Pileus very large and thick, of light weight, dimidiate, sessile, convex above, plane to slightly convex below, 13 × 20 × 8 cm.; surface azonate, glabrous, somewhat uneven, becoming areolate by the cracking of the thin cuticle, fuliginous-bay to blackish-bay, pallid in the cracks, margin acute, undulate or slightly lobed, finely tomentose, grayish-brown; context soft-corky, somewhat zonate, 1–3 cm. thick; tubes minute, corky to woody, isabelline within and without, not distinctly stratified, 3–5 cm. long; mouths subangular to irregular, 2–3 to a mm.; edges thin, entire; spores ellipsoid, smooth, hyaline or very pale yellowish, usually pointed at one end, copious, 11 × 5–6μ.

Type collected on the dead trunk of a silk-cotton tree near Colima, Mexico, January 3–4, 1910, *W. A. & Edna L. Murrill 588*. A large species resembling *Tomophagus Colossus*.

GANODERMA CURTISII (Berk.) Murrill, N. Am. Flora **9**: 120. 1908. Poorly developed sporophores growing at the base of an oak.
Tepeite Valley, *558*.

Ganoderma sessiliforme sp. nov.

Pileus corky to woody, dimidiate, sessile or very slightly stipitate, slightly conchate to fan-shaped, thickest behind, thin at the margin, 3–5 × 6–9 × 1.5–2 cm.; surface laccate in places but mostly covered with powdery conidia, rugose, slightly concentrically sulcate, reddish-chestnut or dull-brownish, margin pallid, rather thin, sterile, slightly undulate; context corky, radiate-fibrous, isabelline to isabelline-fulvous, thinner than the length of the tubes; tubes about 7 mm. long, slender, 4–6 to a mm., avel-

laneous within; mouths circular, edges entire, rather thick, becoming thinner with age, pallid with a greenish-white tint; spores oblong-ovoid, pointed at one end, minutely roughened, thick-walled, umbrinous under a microscope, copious, 10–11 × 5μ.

Type collected on dead wood near Cuernavaca, Mexico, December 24–27, 1909, *W. A. & Edna L. Murrill 392*. This species has many points in common with *Ganoderma sessile*.

GANODERMA SUBINCRUSTATUM Murrill, N. Am. Flora **9**: 122. 1908.

Cuernavaca, *393;* Tecoman, *632*.

POLYPORUS AEGERITA Fries, Nova Acta Soc. Sci. Upsal. III. **1**: 70. 1851. Type collected in Mexico by Liebmann. A doubtful species near *Fomes geotropus* but smaller.

PYROPOLYPORUS EXTENSUS (Lév.) Murrill, N. Am. Flora **9**: 110. 1908. Collected in Mexico by C. L. Smith. *Ganoderma mexicanum* Pat., described from Mexico in 1898, is probably synonymous.

PYROPOLYPORUS IGNIARIUS (L.) Murrill, Bull. Torrey Club **30**: 110. 1903. Reported by Patouillard in 1896 from Diguet's collection on a trunk of *Palo blanco* in Lower California. Specimens not seen.

PYROPOLYPORUS LINTEUS (Berk. & Curt.) Murrill, Bull. Torrey Club **30**: 119. 1903. The following notes, mostly made in the field, refer more particularly to the Jalapa collection: Young, growing specimens from one to three years old. Applanate, broadly sessile, slightly flexible, sulcate-zonate, villose-tomentose, castaneous with a fulvous tint, margin sterile, obtuse, melleous; context zonate, melleous, bounded above by a dark, horny layer; hymenium umbrinous with a grayish tint, tubes invisible to the unaided eye, fulvous-chestnut within; spores globose, deep-ferruginous, copious, 4μ; cystidia cuspidate, dark-fulvous, 60–120 × 10–20μ. An interesting feature of this species is the appearance under a pocket lens of numerous large, brown, pointed cystidia on the broken surfaces of the young context.

Jalapa, *37;* Tecoman, *628½*.

Pyropolyporus melleicinctus sp. nov.

Pileus woody, dimidiate, sessile, convex above, plane below, 3 × 5–6 × 1.5 cm.; surface subglabrous to glabrous, subzonate, black or dark-bay behind, melleous on the margin, nearly smooth, slightly rimose on drying or with age, margin entire, fertile, acute

or slightly obtuse; context light-fulvous, shining, faintly zonate, woody, about 1 cm. thick; tubes slender, fulvous within, 3–5 mm. long, not distinctly stratified; mouths small, subcircular, 3–4 to a mm.; edges rather thick, obtuse, isabelline-umbrinous, glistening; spores subglobose to globose, smooth, fulvous, 4–6μ; cystidia none.

Type collected on dead wood near Tehuantepec, Mexico, in June, 1910, *C. R. Orcutt.*

PYROPOLYPORUS PSEUDOSENEX Murrill, N. Am. Flora **9**: 107. 1908. Collected in Mexico by C. L. Smith.

PYROPOLYPORUS SUBLINTEUS Murrill, N. Am. Flora **9**: 110. 1908. Type collected at Topolobampo, Mexico, by Lulu Stanley and Ida Scully.

PYROPOLYPORUS SUBPECTINATUS Murrill, N. Am. Flora **9**: 109. 1908.

Jalapa, *45, 230.*

PYROPOLYPORUS YUCATANENSIS Murrill, Bull. Torrey Club **30**: 119. 1903.

Tecoman, *628.*

XANTHOCHROUS IGNIARIOIDES Pat. Bull. Soc. Myc. Fr. **14**: 54. 1898. A doubtful species described from Mexico, apparently near *Pyropolyporus Everhartii.*

Tribe DAEDALEAE

DAEDALEA AMANITOIDES Beauv. Fl. Oware **1**: 44. *pl. 25.* 1805.

Jalapa, *42, 54, 209;* Orizaba, *864;* Motzorongo, *1024;* Xuchiles, *1172.*

DAEDALEA CONFRAGOSA (Bolt.) Pers. Syn. 501. 1801. Collected in Mexico by Scheide and described by Fries as *Lenzites bicolor.*

Daedalea favoloides sp. nov.

Pileus coriaceous, reniform, applanate or subconchate, narrowly attached, 5–6 × 8–10 × 0.3 cm.; surface glabrous, somewhat rugose, narrowly concentrically zonate-sulcate, avellaneous or avellaneous-umbrinous tinted with bay, margin thin, lobed; context very thin, punky, pallid to slightly yellowish-brown, about 2 mm. thick; furrows 1–2 mm. deep, labyrinthiform varying to circular or sublamellate in places, very narrow, about 2 to a mm., avellaneous, becoming umbrinous with age; edges thin, dentate to subirpiciform.

Type collected on a fallen log in a moist virgin forest near Jalapa, Mexico, December 12–20, 1909, *W. A. & Edna L. Murrill 48.* Very similar to *Favolus tenuis* above, but with hymenium partly tubular and partly furrowed. This condition has never been ob-

served in *Favolus tenuis*, although thousands of specimens from all parts of the tropical world have been examined.

DAEDALEA MICROSTICTA Cooke, Grevillea **10**: 122. 1882. Described from specimens collected on dead wood at Rio Janeiro, Brazil, by Glaziou. Pileus 8–12 cm. broad, 3 cm. thick behind, pallid, isabelline or darker within, furrows narrow. Collected in Costa Rica by Maxon, in British Honduras by M. E. Peck, and in Guatemala by Kellerman.

Tecoman, *623*.

DAEDALEA SPRUCEI Berk. Jour. Bot. & Kew Misc. **8**: 236. 1856. Described from Brazil and also collected at Jalapa, Mexico, by C. L. Smith.

GLOEOPHYLLUM BERKELEYI (Sacc.) Murrill, Bull. Torrey Club **32**: 370. 1905.

Motzorongo, *978*, *1042*.

GLOEOPHYLLUM HIRSUTUM (Schaeff.) Murrill, Jour. Myc. **9**: 94. 1903.

Cuernavaca, *355*, *366;* Motzorongo, *973*.

GLOEOPHYLLUM STRIATUM (Sw.) Murrill, Bull. Torrey Club **32**: 370. 1905.

Jalapa, *205*, *212;* Tecoman, *684;* Motzorongo, *1019*, *1020*.

Gloeophyllum trabeiforme sp. nov.

Pileus corky, flabelliform, narrowly attached by a stipitiform base, plane or slightly depressed above, convex below, 2.5–3.5 × 3–5.5 × 0.5–1 cm.; surface glabrous, slightly roughened with radiating raised lines resembling appressed fibers, somewhat shining, slightly zonate or sulcate, pale-fulvous with a chestnut tint, marked with two or more narrow, irregular, pale-chestnut zones, margin thin, entire, concolorous; context punky, thin, rosy-incarnate; furrows 0.5 mm. broad, 2–4 mm. deep, fuliginous-chestnut within and without; mouths irregular, varying from nearly circular to daedaleoid or radially elongate, frequently interrupted; edges thin, uneven or lacerate with age.

Type collected on dead wood near Xuchiles, Mexico, January 17, 1910, *W. A. & Edna L. Murrill*, *1177*. Related to *G. trabeum*.

LENZITES BETULINA (L.) Fries, Epicr. Myc. 405. 1838.

Jalapa, *206;* Tepeite Valley, *570*.

LENZITES BETULINIFORMIS Murrill, N. Am. Flora **9**: 128. 1908. Type collected at Jalapa, Mexico, by C. L. Smith.

LENZITES MEXICANA Mont. Ann. Sci. Nat. II. **20**: 360. 1843. A doubtful species near *Gloeophyllum striatum*, collected by Andrieux in the province of Oaxaca, Mexico.

Lenzites subbetulina sp. nov.

Pileus thin, coriaceous, flexible, reniform, narrowly attached, somewhat conchate, 2.5 × 4 × 0.3–0.6 cm.; surface velvety, tomentose or finely hirsute, narrowly concentrically sulcate-zonate, cremeous to greenish-avellaneous, the green color probably being due to algae, margin thin, entire or slightly undulate; context thin, white; hymenium cremeous, furrows very narrow, rarely anastomosing, about 0.5 mm. broad and 1.5–2.5 mm. deep; edges thin, undulate to slightly lacerate, coriaceous, cremeous within; spores not found.

Type collected on dead wood in a coffee plantation at Orizaba, Mexico, January 10–14, 1910, *W. A. & Edna L. Murrill 878*. This species resembles *L. betulina*, but is more delicate and has much closer and thinner lamellae. Its surface closely resembles that of *Coriolus pavonius* and allied species.

LENZITES VERRUCOSA Kickx, Bull. Acad. Roy. Belg. 8²: 73. *pl. 1*. 1841. Described from specimens collected by Galeotti in 1838 near Jalapa, Mexico, on old oaks and rarely on *Liquidambar*. Apparently near *Gloeophyllum Berkeleyi*, but larger, with lighter-colored context, and growing on frondose trees. The author states that it is intermediate between *Lenzites striata* and *L. tricolor*. If the furrows were narrower, it would approach rather closely to *Daedalea microsticta*.

NEW COMBINATIONS

For the benefit of those using Saccardo's nomenclature, the following new species in the above article are recombined, as follows:

CORIOLOPSIS CAPERATIFORMIS = **Polystictus caperatiformis**
CORIOLOPSIS CROCATIFORMIS = **Polystictus crocatiformis**
CORIOLOPSIS FUMOSA = **Polystictus fumosus**
CORIOLOPSIS SARCITIFORMIS = **Polystictus sarcitiformis**
CORIOLUS CONCAVUS = **Polystictus concavus**
CORIOLUS IRPICIFORMIS = **Polystictus irpiciformis**
CORIOLUS ORIZABENSIS = **Polystictus orizabensis**
CORIOLUS SUBPAVONIUS = **Polystictus subpavonius**
CORIOLUS TEPEITENSIS = **Polystictus tepeitensis**
CORIOLUS XUCHILENSIS = **Polystictus xuchilensis**
FAVOLUS TENUIFORMIS = **Hexagonia tenuiformis**
GANODERMA AREOLATUM = **Fomes areolatus**
GANODERMA SESSILIFORME = **Fomes sessiliformis**
GLOEOPHYLLUM TRABEIFORME = **Lenzites trabeiformis**
GRIFOLA LENTIFRONDOSA = **Polyporus lentifrondosus**
HEXAGONA DAEDALEIFORMIS = **Favolus daedaleiformis**
HEXAGONA MOTZORONGENSIS = **Favolus motzorongensis**
HEXAGONA SULFUREA = **Favolus sulfureus**
PYROPOLYPORUS MELLEICINCTUS = **Fomes melleicinctus**
TYROMYCES SEMISUPINIFORMIS = **Polyporus semisupiniformis**

Additions to the Paleobotany of the Cretaceous Formation on Long Island. No. III

By Arthur Hollick

(Plates 162–170)

INTRODUCTION

Three previous papers, dealing directly or indirectly with the Cretaceous flora of Long Island, were published by the writer,* all of which, together with a number of contributions to the Cretaceous flora of the adjacent islands, were subsequently revised and were included in and issued in the form of a single quarto volume.† In this monograph the general stratigraphic relations of the insular plant-bearing horizons may be found fully described and discussed and, as no additional information in relation to the subject has since been acquired, any extended remarks in such connection in this paper do not seem to be necessary.

Subsequent to the time when the above-mentioned monograph went to press, however, a considerable amount of new paleobotanical material was collected from Staten Island, Martha's Vineyard and Long Island, which latter it is the object of the present paper to describe. Some of the specimens were obtained from the clay outcrop in the beach a short distance west of the Glen Cove steamboat dock, where the bulk of the previous collections were made; but the larger part was found on the east side of Manhasset Neck, in the vicinity of Roslyn, in J. B. King & Co.'s gravel pit—a locality not before examined for fossil plants.

This pit is excavated in the Manhasset gravels, which constitute the major formation of the deeply dissected, early Pleistocene ter-

* 1. Preliminary Contribution to Our Knowledge of the Cretaceous Formation on Long Island and Eastward. Trans. New York Acad. Sci. **12**: 222–237, *pl. 5–7*. July 6, 1893.

2. Additions to the Paleobotany of the Cretaceous Formation on Long Island. Bull. Torrey Bot. Club **21**: 49–65, *pl. 174–180*. Feb. 20, 1894.

3. Additions to the Paleobotany of the Cretaceous Formation on Long Island. No. II. Bull. New York Bot. Gard. **3**: 403–418, *pl. 70–79*. Dec. 10, 1904.

† The Cretaceous Flora of Southern New York and New England. Monog. U. S. Geol. Surv. **50**: Washington, D. C. 1906.

race, extending northward from the terminal moraine to the shores of Long Island Sound and its harbors. A description of the geology of this area, including a discussion of the exact geologic age of the Manhasset gravels, and excellent views of sections of the pit above mentioned, may be found in a paper by J. B. Woodworth,* to which the writer would respectfully refer those who may be interested in the Pleistocene geology of the locality.

The specimens described were all obtained from the ferruginous shale and sandstone constituents of the gravel, representing fragments and masses of Cretaceous clay and sand which were eroded from the parent beds, hardened by oxidation of the included iron, and ultimately worn into the rounded cobblestones and boulders of the Manhasset deposits. The largest Cretaceous fossiliferous boulder thus far brought to light anywhere on Long Island was found in this pit. It was about two cubic feet in mass, and on one of its exposed surfaces were quantities of beautifully preserved leaf impressions. This surface was separated from the main mass and is now in the paleobotanical collection of the Garden. A photograph of a portion of it is represented by Plate 162.

The writer gratefully acknowledges his indebtedness to Mr. George R. King for courtesies extended, and for facilities placed at his disposal, while engaged in collecting at and in the vicinity of the gravel pit. Also to Mr. Howard J. Shannon, of Jamaica, N. Y., for freely placing at his disposal specimens personally collected at the Glen Cove locality. The writer also enjoyed the pleasure and benefit of the companionship of Mr. Edward W. Berry and Mr. Arthur B. Bibbins, of the Maryland Geological Survey, and Professor Edward C. Jeffrey, of Harvard University, during part of the time spent in the field.

All of the specimens described in this paper are included in the paleobotanical collections of the New York Botanical Garden.

DESCRIPTIONS OF SPECIES

CYCADACEAE

PODOZAMITES LANCEOLATUS (Lindley & Hutton) F. Braun

(PLATE 162, in part; PLATE 163, FIGS. 2, 3)

Podozamites lanceolatus (L. & H.) F. Braun, in Münster Beitr. Petrefactenkunde **2**[6]: 33. 1843.

Zamia lanceolata L. & H., Foss. Fl. Gr. Brit. **3**[1]: *pl. 194.* 1837.

* Pleistocene Geology of Portions of Nassau County and Borough of Queens. Bull. No. 48, N. Y. State Museum. Dec. 1901.

Previous to the discovery of the specimens which are the subjects of our illustrations only a single leaflet of this species was recorded from Long Island, which was referred to *P. angustifolius*.* The aggregation of specimens shown on Plate 163, Figs. 2, 3, however, which are all included in the single large piece of matrix represented, in part, by Plate 162, indicate a great diversity in the shape and size of the leaflets and, did they not occur so closely associated together, might well be regarded as belonging to two different species—the broader ones referable to *P. lanceolatus* and the narrower ones to *P. angustifolius* (Eichw.) Schimp. (= *P. Knowltoni* Berry);† and in this connection it is interesting to note that Newberry‡ grouped together a closely similar lot of specimens, from the Cretaceous of New Jersey, under *P. angustifolius*, with the following qualifying remark: "In general appearance these leaves are not unlike some of the many forms of *P. lanceolatus*, but are usually longer, narrower, and more flexuous in outline." One of Newberry's specimens (Newb., *loc. cit., f. 2*) undoubtedly belongs to the latter species and, judging from a comparison of all of the material now available, the conclusion may be justified that probably one species only (*P. lanceolatus*) is represented by all of the specimens mentioned from New Jersey and Long Island.

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Sept. 26, 1906.

Williamsonia problematica (Newberry) Ward

(Plate 163, Fig. 4)

Williamsonia problematica (Newb.) Ward, Fifteenth Ann. Rept. U. S. Geol. Surv. **1893–94**: 382. 1895.

Palaeanthus (*Williamsonia*) *problematicus* Newb., Monog. U. S. Geol. Surv. **26** (Fl. Amboy Clays): 125, *pl. 35, f. 1–9*. 1895.

This specimen is undoubtedly generically identical with the organisms to which the above bi-generic name was given by Newberry and, apparently, it represents the same species.

In our specimen, the first one thus far recorded from Long Island, the outer floral envelopes are missing, and the interior

* Hollick, A., Bull. New York Bot. Gard. **3**: 410, *pl. 71, f. 8*. 1905.

† Berry, E. W., Bull. Torrey Bot. Club **36**: 247. May, 1909.

‡ Newberry, J. S., Monog. U. S. Geol. Surv. **26** (Fl. Amboy Clays): 44, *pl. 13, f. 1–4*.

parts, whatever they may be morphologically, are closely compacted so that their individual characters are difficult to define with accuracy. In this respect it resembles specimens from Gay Head, Marthas Vineyard,* more closely than those from New Jersey depicted by Newberry (*loc. cit.*), and is strikingly similar to *Williamsonia cretacea* Heer,† from the approximately equivalent Lower Atané beds of Greenland.

Locality: Glen Cove, N. Y. Hollick, Berry and Bibbins, June 23, 1905.

Juglandaceae

Juglans arctica Heer

(Plate 164, Figs. 3, 4)

Juglans arctica Heer, Fl. Foss. Arct. **6**[2]: 71, *pl. 40, f. 2, pl. 41, f. 4c, pl. 42, f. 1a, 2, 2a, pl. 43, f. 3.* 1882.

These are the first specimens which I have seen from Long Island which are clearly referable to this species as distinguished from the one next following. Unfortunately, however, all of the specimens thus far brought to light are too fragmentary for completely satisfactory identification, especially the one represented by Figure 3.

Locality: King's gravel pit, Roslyn, N. Y. (Pl. 164, Fig. 3). Hollick, Sept. 26, 1906. Glen Cove, N. Y. (Pl. 164, Fig. 4). Hollick and Jeffrey, April 18, 1906.

Juglans crassipes Heer

(Plate 164, Fig. 5)

Juglans crassipes Heer, Neue Denkschr. Schw. Gesellsch. Naturwissensch. **23**[2] (Kreide-Fl. Moletein): 23, *pl. 6, f. 3.* 1869.

Thus far two specimens have been recorded from Long Island which may be referred to this species, but they are represented by basal portions of the leaves only. One of these is the specimen now figured, the other was originally referred, with question, to *J. arctica.*‡

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Sept. 26, 1906.

* Hollick, A., Monog. U. S. Geol. Surv. **50** (Cret. Fl. S. N. Y. & N. Eng.): *pl. 5, f. 27–30.*

† Heer, O., Fl. Foss. Arct. **6**[2]: 59, *pl. 12, f. 1, pl. 13, f. 9.*

‡ "*Juglans arctica* Heer (?)," Hollick, Bull. Torrey Bot. Club **21**: 51, *pl. 178, f. 2.* 1894.

MORACEAE

Ficus Krausiana subsimilis var. nov.

(PLATE 164, FIGS. 1, 2)

Leaf lanceolate, entire, narrowed to the attenuate summit, narrowly wedge-shaped at the base; midrib relatively thin; secondary nerves numerous, fine, more or less flexuous, irregularly divergent at acute angles from the midrib, thinning out, extending close to, and bending upward along the margin.

These are the first specimens representing this variety which I have thus far seen from Long Island; but a specimen from Block Island, which was originally referred to the species,* is clearly identical with the variety, which may be distinguished by its much thinner midrib and more elongated summit, in which latter feature it more nearly resembles *F. Mohliana* Heer.† Our Figure 2 should perhaps be questioned, inasmuch as the upper part of the specimen is missing, and it may represent either the species or the variety.

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Sept. 26, 1906.

FICUS MYRICOIDES Hollick?

(PLATE 166, FIG. 2)

Ficus myricoides Hollick, in Newberry Monog. U. S. Geol. Surv. **26** (Fl. Amboy Clays): 71, *pl. 32, f. 18, pl. 41, f. 8, 9.* 1895.

This specimen agrees more or less satisfactorily, except in its larger size, with *figures 8 and 9, on plate 41* of the Flora of the Amboy Clays (*loc. cit.*), and it is evidently identical with other specimens from Long Island,‡ which have been referred to the species. It is unfortunate that the fragmentary nature of all of our specimens renders accurate comparison impossible.

Berry§ has criticized the generic reference of the species and also the specific identity of certain specimens which were referred to the species, and says: "This is especially true of the Long Island and Marthas Vineyard leaves which are larger and which suggest

* "*Ficus Krausiana* Heer," Hollick, A., Annals New York Acad. Sci. **11**: 59, *pl. 3, f. 1.* 1898.

† Heer, O., Neue Denkschr. Schw. Gesellsch. Naturwissensch. **23**[3] (Kreide-Fl. Moletein): 15, *pl. 5, f. 2.* 1869.

‡ Hollick, A., Monog. U. S. Geol. Surv. **50** (Cret. Fl. S. N. Y. & N. Eng.): 57, *pl. 11, f. 8, 9.*

§ Berry, E. W., Bull. 3 (Fl. Raritan Form.) Geol. Surv. N. J., 121. 1911.

to the writer some of the many species of *Magnolia* identified by Dr. Hollick in the insular deposits." The only leaf of this genus, however, with which it appears to be possible to confound it, is *M. Van Ingeni* Hollick* which, however, is more flexuous in outline, midrib, and secondary nervation than is the species in question. Possibly, if an entire leaf, or one in which the summit is preserved, should be discovered, it might be necessary to describe our specimens under a new specific name, but hardly under any genus other than *Ficus*.

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Sept. 26, 1906.

Ficus Woolsoni Newberry

(Plate 165, Fig. 3)

"*Ficus Woolsoni* Newb. in mss.," Hollick, Trans. N. Y. Acad. Sci. **12**: 33, *pl. 2, f. 1, 2c.* 1892.

Ficus Woolsoni Newb., Monog. U. S. Geol. Surv. **26** (Fl. Amboy Clays): 70, *pl. 20, f. 3, pl. 23, f. 1–6.* 1895.

Although the base of our specimen is missing there can be hardly any doubt in regard to its identity with this species, especially when compared with Newberry's *figures 3 and 5, plate 23* (*loc. cit.*).

It is interesting to find another of the characteristic Amboy Clay species represented in the Cretaceous flora of Long Island.

Locality: Glen Cove, N. Y. Hollick, Berry and Bibbins, June, 23, 1905.

Proteaceae

Embothriopsis presagita gen. et sp. nov.

(Plate 165, Fig. 1)

Leaf ellipsoidal, entire, 1.1 dm. long by .45 dm. wide, rather abruptly attenuate at the summit, rounded at the base, thence continuing as narrow alate borders to the short petiole; nervation camptodrome; secondary nerves irregularly disposed in opposite or sub-opposite pairs, basal pair weak, extending upward subparallel with the margin to about half the length of the leaf, second pair stronger, somewhat simulating lateral primaries, both pairs leaving the midrib at acute angles of divergence, upper pairs at more obtuse angles, all curving around and thinning out close to the margin, where they are apparently connected by and merge into the fine tertiary nervation.

* Hollick, A., Bull. Torrey Bot. Club **21**: 61, *pl. 175, f. 6.* 1894.

I have been unable to identify this leaf satisfactorily with any living or extinct genus with which I am familiar; but the family relationship appears to be with the Proteaceae, so far as the nervation is concerned. Many of the broad leaved species in certain genera belonging to this family possess the type of nervation indicated in our specimen, and for purposes of comparison I have depicted (see Plate 165, Figure 2) a leaf of *Embothrium grandiflora* R. Br., a living Peruvian species, with which the relationship of our specimen is presaged in the name adopted.

Locality: Glen Cove, N. Y. Hollick, Berry and Bibbins, June 23, 1905.

Nymphaeaceae

Nelumbo Kempii (Hollick) Hollick

(Plate 166, Figs. 3, 4)

Nelumbo Kempii (Hollick) Hollick, Bull. New York Bot. Gard. **3**: 412, *pl. 74, f. 1, 2, pl. 75, pl. 76, pl. 77, f. 1.* 1904.

Serenopsis Kempii Hollick, Bull. Torrey Bot. Club **20**: 169, *pl. 149.* 1893.

This species is quite abundantly represented in the Cretaceous flora of Long Island, and the leaves vary greatly in size, as may be seen by comparison between the fragment of the large one shown in Figure 4 and the complete small one shown in Figure 3. These two specimens represent the largest and the smallest specimens thus far found. The former must have had a diameter of at least 4.5 dm., while the latter has a diameter of only 4.75 cm.

Locality: Glen Cove, N. Y. (Plate 166, Fig. 3). Howard J. Shannon, 1912.

King's gravel pit, Roslyn, N. Y. (Plate 166, Fig. 4). Hollick, Sept. 26, 1906.

Magnoliaceae

Magnolia longipes Newberry?

(Plate 167, Fig. 1)

"*Magnolia longipes* Newb. mss.," Hollick, Bull. Torrey Bot. Club **21**: 60, *pl. 178, f. 1, 3.* 1894.

Magnolia longipes Newb., Monog. U. S. Geol. Surv. **26** (Fl. Amboy Clays): 76, *pl. 54, f. 1–3.* 1895.

It is unfortunate that neither this nor either of the two specimens

previously collected on Long Island (Hollick, *loc. cit.*) is sufficiently perfect for definite identification. More or less satisfactory comparison, however, may be made with Newberry's *figure 1, plate 54* (*loc. cit.*).

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Aug. 4, 1905.

Magnolia Van Ingeni Hollick?

(Plate 168, Fig. 1)

Magnolia Van Ingeni Hollick, Bull. Torrey Bot. Club **21**: 61, *pl. 175, f. 6.* 1894.

This specimen agrees quite satisfactorily with the type of the species (Hollick, *loc. cit.*), in the shape of the base and general characters of the outline; but the absence of any trace of secondary nervation renders the identification doubtful. The type specimen, collected at Sea Cliff, is the only one of the species heretofore seen by me from Long Island.

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Sept. 26, 1906.

Magnolia Woodbridgensis Hollick

(Plate 162, in part; Plate 167, Fig. 2)

Magnolia Woodbridgensis Hollick, in Newberry, Monog. U. S. Geol. Surv. **26** (Fl. Amboy Clays): 74, *pl. 36, f. 11, pl. 57, f. 5–7.* 1895.

This is the first specimen of the species thus far reported from Long Island and, fortunately, it is well preserved and almost perfect, except for the extremity of the tip, which is missing. It is somewhat larger than any of the specimens figured by Newberry, and appears to have been somewhat more attenuate at the summit; but in all essential characters it is identical.

Figure 2, on Plate 167, is reproduced from a drawing of the specimen included in Plate 162, and is designed to show the details of nervation which are not very clearly defined in the photograph.

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Sept. 26, 1906.

Lauraceae

Sassafras acutilobum Lesquereux

(Plate 168, Fig. 3)

Sassafras acutilobum Lesq., Rept. U. S. Geol. Surv. Terr. **6** (Cret. Fl.): 79, *pl. 14, f. 1, 2.* 1874.

This is the second specimen recorded from Long Island which has been referred to this species. The first one was found at Glen Cove,* and it is in about the same condition of preservation as the one now figured. The question may be raised whether either of these specimens should be regarded as specifically identical with the narrower and more acutely lobed leaves depicted by Lesquereux (*loc. cit.*); but other authorities, notably Newberry,† have referred such a diverse series of forms to the species that it seems justifiable to also include ours.

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Sept. 26, 1906.

Laurus plutonia Heer

(Plate 169, Figs. 3–5)

Laurus plutonia Heer, Fl. Foss. Arct. **6**[2]: 75, *pl. 19, f. 1d, 2–4, pl. 20, f. 3a, 4–6, pl. 24, f. 6b, pl. 28, f. 10, 11, pl. 42, f. 4b.* 1882; *ibid.* **7**: 30, *pl. 58, f. 2, pl. 62, f. 1a.* 1883.

The three specimens here figured are, unfortunately, but little more complete than are those previously found on Long Island;‡ but they all, apparently, represent the relatively short, broad form of this variable species.

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Sept. 26, 1906.

Laurophyllum elegans Hollick

(Plate 170, Figs. 5, 6)

Laurophyllum elegans Hollick, Monog. U. S. Geol. Surv. **50** (Cret. Fl. S. N. Y. & N. Eng.): 81, *pl. 27, f. 1–5.* 1906.

It is with some hesitation that I have decided to include in this species the specimen represented by Figure 6, Plate 170, on account of its length, which was evidently about twice that of any other specimen heretofore figured. Also, the lower portion is missing; but the shape of the upper part and the characters of the nervation are identical with those of Figure 5 on the same plate, the identity of which can hardly be questioned. It is also a significant fact that both of our specimens occur in close juxtaposition, in the same piece of matrix.

* Hollick, A., Trans. New York Acad. Sci. **12**: 236, *pl. 7, f. 1.* 1893.

† Newberry, J. S., Monog. U. S. Geol. Surv. **26** (Fl. Amboy Clays): 87, *pl. 25, f. 1–10, pl. 26, f. 2–6.* 1895.

‡ Hollick, A., Monog. U. S. Geol. Surv. **50** (Cret. Fl. S. N. Y. & N. Eng.) *pl. 28, f. 1, 2.*

One other specimen (Hollick, *loc. cit., f. 2*) has been found on Long Island, which was originally referred to *Laurus plutonia* Heer.*

Locality: Glen Cove, N. Y. Hollick, Berry and Bibbins, June 23, 1905.

Laurophyllum lanceolatum Newberry

(Plate 169, Fig. 2)

Laurophyllum lanceolatum Newb., Monog. U. S. Geol. Surv. **26** (Fl. Amboy Clays): 87, *pl. 17, f. 1, 12.* 1895.

This species is exceedingly difficult to distinguish from certain leaves which have been identified as, or referred to *Laurus plutonia* Heer, by various authors. If, however, they are to be regarded as distinct species, our specimen is undoubtedly identical with Newberry's *figure 12* (*loc. cit.*).

The species has not heretofore been recognized in any of the Long Island collections, but a leaf from Block Island, which was referred by me to *Laurus plutonia*,† might well be included in *Laurophyllum lanceolatum* in accordance with my present interpretation of the species.

Locality: Glen Cove, N. Y. Hollick, Berry and Bibbins, June 23, 1905.

Laurophyllum ocoteaeoides sp. nov.

(Plate 169, Figs. 1, 6)

Leaf broadly linear-lanceolate and sub-falcate, slightly inequilateral at the base, entire, 1.5 dm. or more in length by 3.5 cm. in maximum width, cuneate wedge-shaped at the base, apparently narrowed to a blunt apex at the summit; midrib strong; secondary nerves fine, mostly leaving the midrib at obtuse or right angles, curving abruptly and extending upward close to the margin, where they merge into each other and form an irregular but continuous nerve about .5–1 mm. distant from the margin; tertiary nervation merging into the secondary and often difficult to distinguish from it, together forming a fine reticulated network throughout.

This beautiful and well-defined species is quite closely similar to a number of living species in the Lauraceous genera *Oreodaphne*, *Persea*, *Nectandra* and *Ocotea* and this relationship is indicated in the name adopted.

* Hollick, A., Trans. New York Acad. Sci. **12**: 236, *pl. 6, f. 1.* 1893.

† Hollick, A., Monog. U. S. Geol. Surv. **50** (Cret. Fl. S. N. Y. & N. Eng.): *pl. 27, f. 10.*

Locality: Glen Cove, N. Y. Hollick, Berry and Bibbins, June 23, 1905.

LEGUMINOSAE (CAESALPINIACEAE)

Cassia insularis sp. nov.

(PLATE 167, FIG. 3)

Leaf 2.25 cm. long by .75 cm. wide at the middle, entire, ovate-lanceolate, with acute tip and rounded base, symmetrical or slightly inequilateral; secondary nervation sparse, apparently in pairs, leaving the midrib at acute angles of divergence, extending upward and terminating close to the margin.

This leaf has very much the appearance of the specimen from the Lower Atané beds of Greenland which Heer doubtfully refers to his *Cassia antiquorum*.* Inasmuch, however, as he considers this species to be identical with his *Leguminosites cassiaeformis*,† which it in no way resembles, so far as the figures are concerned, I have thought it advisable to regard our specimen as representing a new species and to give it a name indicative of the region where it was found.

Incidentally, if Heer's two names are synonymous, and refer to but one species, the name of the species should be written *Cassia cassiaeformis* (Heer).

Locality: Glen Cove, N. Y. Hollick, Berry and Bibbins, June 23, 1905.

LIRIODENDROPSIS CONSTRICTA (Ward) Hollick

(PLATE 166, FIG. 1)

Liriodendropsis constricta (Ward var.) Hollick, Monog. U. S. Geol. Surv. **50** (Cret. Fl. S. N. Y. & N. Eng.): 71, *pl. 22, f. 7, pl. 26, f. 6–15, pl. 40, f. 15.* 1906.

Liriodendropsis simplex constricta Ward, Sixteenth Ann. Rept. U. S. Geol. Surv. Pt. 1, **1894–95**: 540, *pl. 107, f. 8.* 1896.

I have referred this specimen to the above variable species with considerable hesitation, for the reason that one of the most prominent characters, the emarginate apex, is not preserved. The nervation, however, is identical with that of the genus and the specimen may be compared with the one figured by me from Martha's Vineyard (Hollick, *loc. cit., pl. 22, f. 7*).

The systematic position of the genus has always been in doubt

* Heer, O., Fl. Foss. Arct. **6²**: 109, *pl. 21, f. 1d.* 1882.

† Heer, O., Fl. Foss. Arct. **3** (Kreide-Fl.): 119, *pl. 34, f. 12.* 1874.

and has been the subject of discussion by many different authorities. Newberry, who founded the genus, regarded it as closely allied to *Liriodendron*,* largely on account of the emarginate apex. This feature, however, is equally characteristic of many genera of Leguminosae which also possess nervation exactly comparable with that of *Liriodendropsis*, as for example in *Cassia Fistula* L.,† and the consensus of opinion now seems to be that it is this family in which the genus should be included.

Only one other specimen of the species has thus far been identified from Long Island (Hollick, *loc. cit., pl. 26, f. 15*), and this one is quite different in size and form from the one now figured.

Locality: Glen Cove, N. Y. Hollick, Berry and Bibbins, June 23, 1905.

Liriodendropsis simplex (Newberry) Newberry

(Plate 168, Fig. 2)

Liriodendropsis simplex Newb. (Newb.), Monog. U. S. Geol. Surv. **26** (Fl. Amboy Clays): 83, *pl. 19, f. 2, 3, pl. 53, f. 1–4, 7.* 1895.
Liriodendron simplex Newb. in part, Bull. Torrey Bot. Club **14**: 6, *pl. 62, f. 2, 3.* 1887.

This specimen, although fragmentary, shows the characteristic emarginate apex and general shape of the species. In one or another of its many diverse forms it is one of the most abundant species in the Cretaceous deposits of Long Island and vicinity, and those who may be interested in the genus may find numerous figures of this and allied species, with descriptions and citations, in a previous work by the writer.‡

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Sept. 26, 1906.

Celastraceae

Celastrophyllum crassipes Lesquereux?

(Plate 164, Fig. 6)

Celastrophyllum crassipes Lesq., Monog. U. S. Geol. Surv. **17** (Fl. Dak. Grp.): 174, *pl. 57, f. 6, 7.* 1892.

* Newberry, J. S., Monog. U. S. Geol. Surv. **26** (Fl. Amboy Clays): 82.

† See Ettingshausen, C. R. von, Die Blatt-Skelete der Dikotyledonen, *pl. 92, f. 8, pl. 94, f. 14.*

‡ Hollick, A., The Cretaceous Flora of Southern New York and New England. Monog. U. S. Geol. Surv. **50**.

Our specimen has very nearly the orbicular form of this species, but the nervation is obscure or wanting, and hence the identification is indicated as provisional only. The species has not heretofore been reported from the Cretaceous of Eastern North America.

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Sept. 26, 1906.

Myrtaceae

Eucalyptus Geinitzi (Heer) Heer

(Plate 170, Figs. 1, 2)

Eucalyptus Geinitzi (Heer) Heer, Fl. Foss. Arct. **6**[2]: 93, *pl. 19, f. 1c, pl. 46, f. 12c, 13.* 1882.

Myrtophyllum (*Eucalyptus?*) *Geinitzi* Heer, Neue Denkschr. Schw. Gesellsch. Naturwissensch. **23**[2] (Kreide-Fl. Moletein): 22, *pl. 11, f. 3, 4.* 1869.

Myrtophyllum Geinitzi Heer, Fl. Foss. Arct. **3** (Kreide-Fl.): 116, *pl. 32, f. 14–16, pl. 33, f. 6b.* 1874.

Only one fragment of this variable species has been heretofore recorded from Long Island,* although many specimens have been found on the neighboring islands and in New Jersey. Heer included a considerable variety of forms under the species, and other writers have followed suit, so that it would be quite possible to differentiate more than one variety or species from among them.

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Aug. 4, 1905.

Eucalyptus Geinitzi propinqua var. nov.

(Plate 170, Fig. 3)

Leaf about 8 cm. long by 2.5 cm. wide, entire, flexuous, narrowly elliptical, attenuate at base and summit; secondary nerves fine, irregularly disposed, leaving the midrib at various angles, the lower obtuse, the upper more acute, terminating in a marginal nerve.

I have thought it advisable to regard this specimen as a variety of the species, on account of its greater relative width as compared with others of about the same length. It resembles the fragment depicted by Heer† from the Lower Atané beds of Greenland, but his figure is too imperfect for satisfactory comparison.

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Aug. 4, 1905.

* Hollick, A., Bull. Torrey Bot. Club **21**: 55, *pl. 177, f. 11.* 1894.

† Heer, O., Fl. Foss. Arct. **6**[2]: *pl. 19, f. 1c.*

Myrtophyllum sapindoides sp. nov.

(Plate 167, Fig. 4)

Leaf narrowly linear-lanceolate, about 3 cm. long by .75 cm. maximum width, entire, flexuous, inequilateral and tapering to a wedge-shaped base; secondary nervation fine, numerous, irregularly disposed and diverging from the midrib at varying angles, apparently confluent near the margin.

This leaf has somewhat the appearance of *Myrica Davisii* Hollick,* and might also be compared with certain specimens which have been referred to forms of *Salix proteaefolia* Lesq.,† and to *Myrtophyllum parvulum* Heer.‡ It is also suggestive of *Sapindus apiculatus* Vel.§

Locality: Glen Cove, N. Y. Hollick, Berry and Bibbins, June 23, 1905.

Araliaceae

Aralia coriacea Velenovský

(Plate 167, Fig. 6)

Aralia coriacea Vel., Fl. Böhm. Kreideform. Pt. 3, 11 [58], *pl. 1 [16], f. 1–9, pl. 2 [17], f. 2.* 1884.

This is the second specimen obtained on Long Island which appears to be referable to this species. The one previously described and figured‖ is somewhat broader, but the leaflets vary considerably in size as well as in dentition, and these specimens are closely similar to the smaller and shorter forms figured by Velenovský.

Locality: Glen Cove, N. Y. Hollick and Jeffrey, April 18, 1906.

Oleaceae

Ligustrum subtile sp. nov.

(Plate 167, Fig. 5)

Leaf elliptical in outline, 4 cm. long by 1.7 cm. wide in middle, acute at base and summit; midrib well defined; secondary nervation not apparent.

This leaf has the shape characteristic of *Ligustrum*, especially

* Hollick, A., Trans. New York Acad. Sci. **12**: 32, *pl. 2, f. 3.* 1892.

† Hollick, A., Bull. Torrey Bot. Club **21**: *pl. 174, f. 5.* 1894; Monog. U. S. Geol. Surv. **50** (Cret. Fl. S. N. Y. & N. Eng.): *pl. 8, f. 12.*

‡ Heer, O., Fl. Foss. Arct. **6²**: *pl. 21, f. 4.*

§ Velenovský, J., Fl. Böhm. Kreideform. Pt. 3, 6 [53], *pl. 7* [22], *f. 1–8.*

‖ Hollick, A., Bull. New York Bot. Gard. **3**: 415, *pl. 73, f. 3.* 1904.

of *L. Sinense* Lour. and, apparently, was of a similar coriaceous texture in which the nervation was not preserved.

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Aug. 4, 1905.

PLANTS OF UNDETERMINED FAMILY RELATIONSHIP

Credneria macrophylla Heer

(Plate 170, Fig. 4)

Credneria macrophylla Heer, Neue Denkschr. Schw. Gesellsch. Naturwissensch. **23**[2] (Kreide-Fl. Moletein): 16, *pl. 4.* 1869.

This specimen, except for its smaller size, is identical with the type of the species as figured by Heer, both in nervation and in the strikingly thick midrib; but, unfortunately, neither in the type or in our specimen is the upper part of the leaf preserved.

It is also somewhat suggestive of *Populus hyperborea* Heer,* especially when compared with his *pl. 29, f. 9, pl. 30, f. 2b*, and *pl. 21, f. 1a* (*loc. cit.*), but is larger and has much more robust nervation and midrib.

The botanical relationships of the genus *Credneria* are not known and have been the subject of discussion ever since the time when the genus was first described,† and a number of writers since then have suggested its affinity with the Salicaceae, Urticaceae, Hamamelidaceae, Polygonaceae, or some other widely separated family.

Our specimen represents an addition to the Cretaceous flora of the United States as well as to that of Long Island.

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Aug. 4, 1905.

Tricalycites major Hollick

(Plate 163, Fig. 1)

Tricalycites major Hollick, Bull. New York Bot. Gard. **3**: 416, *pl. 72, f. 3–7.* 1904.

The type specimen of this species and those subsequently figured‡ are all considerably smaller in size than others recently found, two of which are the subject of our illustration. Thus far it has not been reported elsewhere than from Long Island. The

* Heer, O., Fl. Foss. Arct. **3** (Kreide-Fl.): 106, *pl. 27, f. 8d, pl. 29, f. 6, 7a, 8a, 9, pl. 30, f. 2b.* 1874; *Ibid.* **6**[2]: 64, *pl. 17, f. 6, 7, pl. 21, f. 1a.* 1882.

† Zenker, H. C., Beitr. Naturgesch. Urwelt, 15. 1833.

‡ Hollick, A., Monog. U. S. Geol. Surv. **50** (Cret. Fl. S. N. Y. & N. Eng.): *pl. 5, f. 13–22.*

botanical affinities of the genus, or even the exact nature of the organism, have never been satisfactorily determined.

Locality: King's gravel pit, Roslyn, N. Y. Hollick, Aug. 4, 1905.

EXPLANATION OF PLATES 162–170

Plate 162

PAGE

Photograph of a part of a large piece of matrix, showing *Magnolia Woodbridgensis* Hollick, and *Podozamites lanceolatus* (L. & H.) F. Braun... 155

Plate 163

Fig. 1. *Tricalycites major* Hollick..... 168
Figs. 2, 3. *Podozamites lanceolatus* (L. & H.) F. Braun..... 155
Fig. 4. *Williamsonia problematica* (Newb.) Ward..... 156

Plate 164

Figs. 1, 2. *Ficus Krausiana subsimilis* var. nov..... 158
Figs. 3, 4. *Juglans arctica* Heer..... 157
Fig. 5. *Juglans crassipes* Heer..... 157
Fig. 6. *Celastrophyllum crassipes* Lesq.?..... 165

Plate 165

Fig. 1. *Embothriopsis presagita* gen. et sp. nov..... 159
Fig. 2. *Embothrium grandiflora* R. Br. (introduced for comparison).... 160
Fig. 3. *Ficus Woolsoni* Newb..... 159

Plate 166

Fig. 1. *Liriodendropsis constricta* (Ward) Hollick..... 164
Fig. 2. *Ficus myricoides* Hollick?..... 158
Figs. 3, 4. *Nelumbo Kempii* (Hollick) Hollick..... 160

Plate 167

Fig. 1. *Magnolia longipes* Newb.?..... 160
Fig. 2. *Magnolia Woodbridgensis* Hollick..... 161
Fig. 3. *Cassia insularis* sp. nov.. 164
Fig. 4. *Myrtophyllum sapindoides* sp. nov..... 167
Fig. 5. *Ligustrum subtile* sp. nov..... 167
Fig. 6. *Aralia coriacea* Vel..... 167

Plate 168

Fig. 1. *Magnolia Van Ingeni* Hollick?..... 161
Fig. 2. *Liriodendropsis simplex* (Newb.) Newb..... 165
Fig. 3. *Sassafras acutilobum* Lesq..... 161

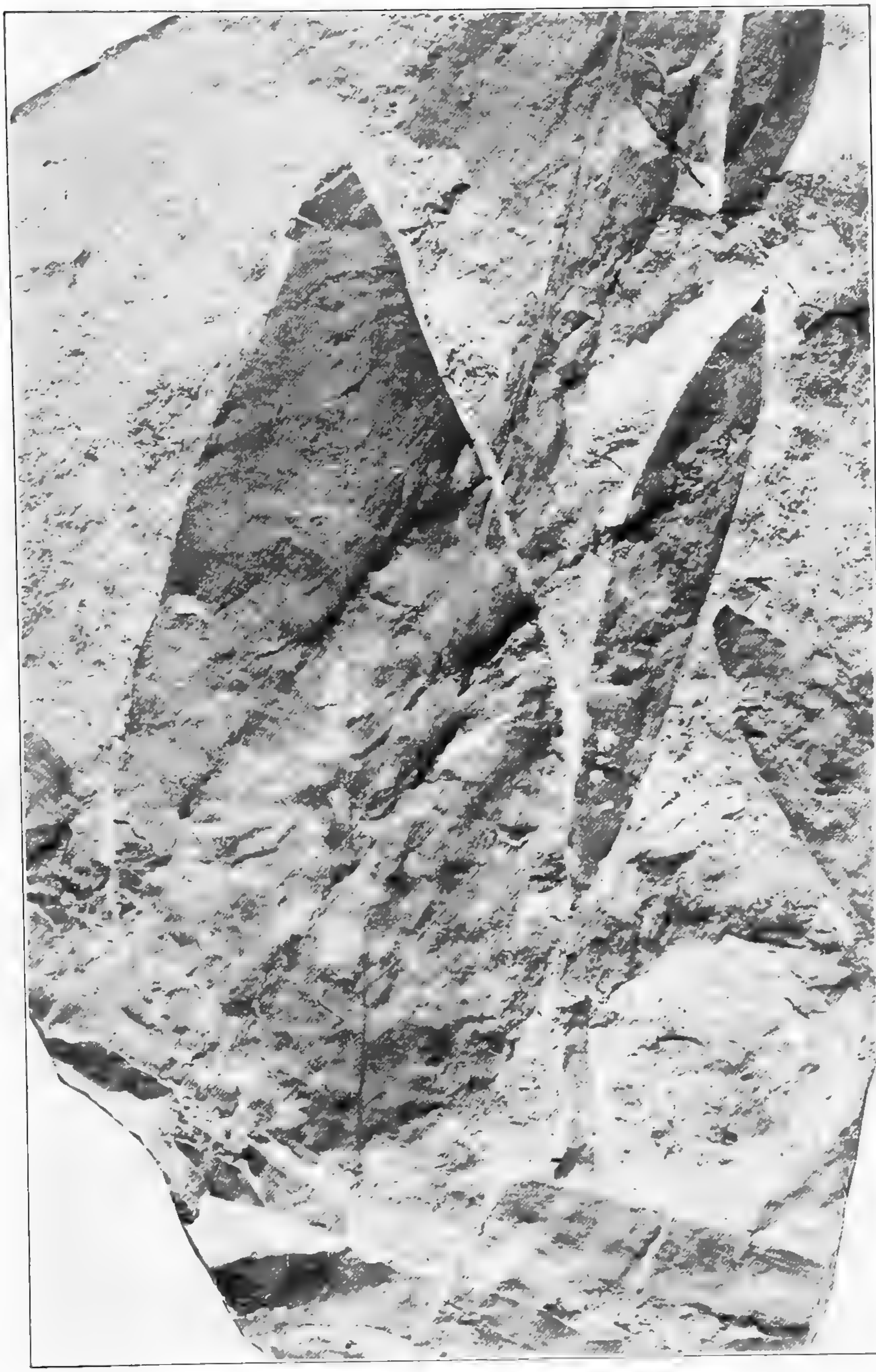
Plate 169

Figs. 1, 6. *Laurophyllum ocoteaeoides* sp. nov..... 163
Fig. 2. *Laurophyllum lanceolatum* Newb..... 163
Figs. 3–5. *Laurus plutonia* Heer..... 162

Plate 170

PAGE

Figs. 1, 2. *Eucalyptus Geinitzi* (Heer) Heer..... 166
Fig. 3. *Eucalyptus Geinitzi propinqua* var. nov..... 166
Fig. 4. *Credneria macrophylla* Heer..... 168
Figs. 5, 6. *Laurophyllum elegans* Hollick..... 162



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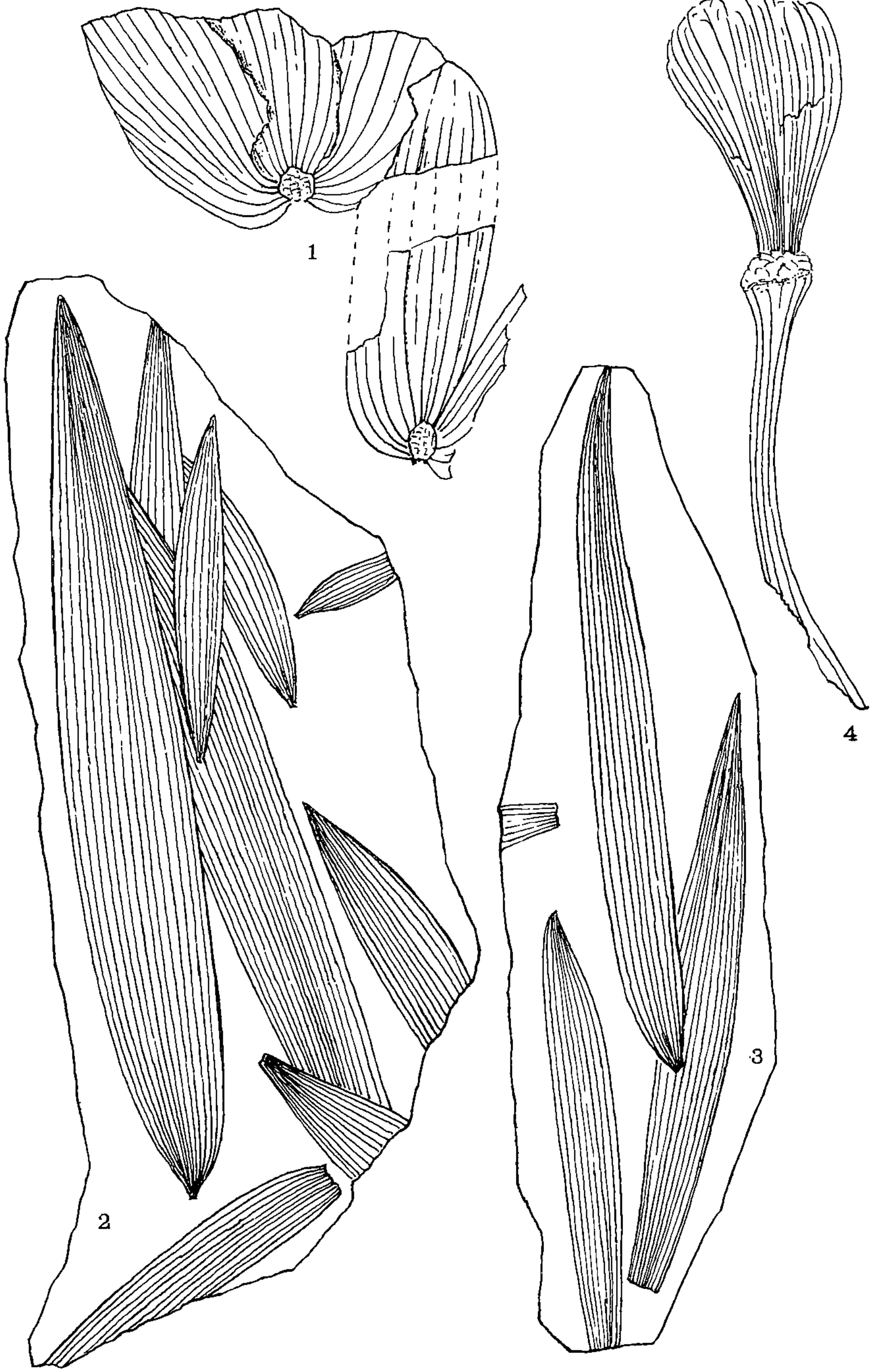

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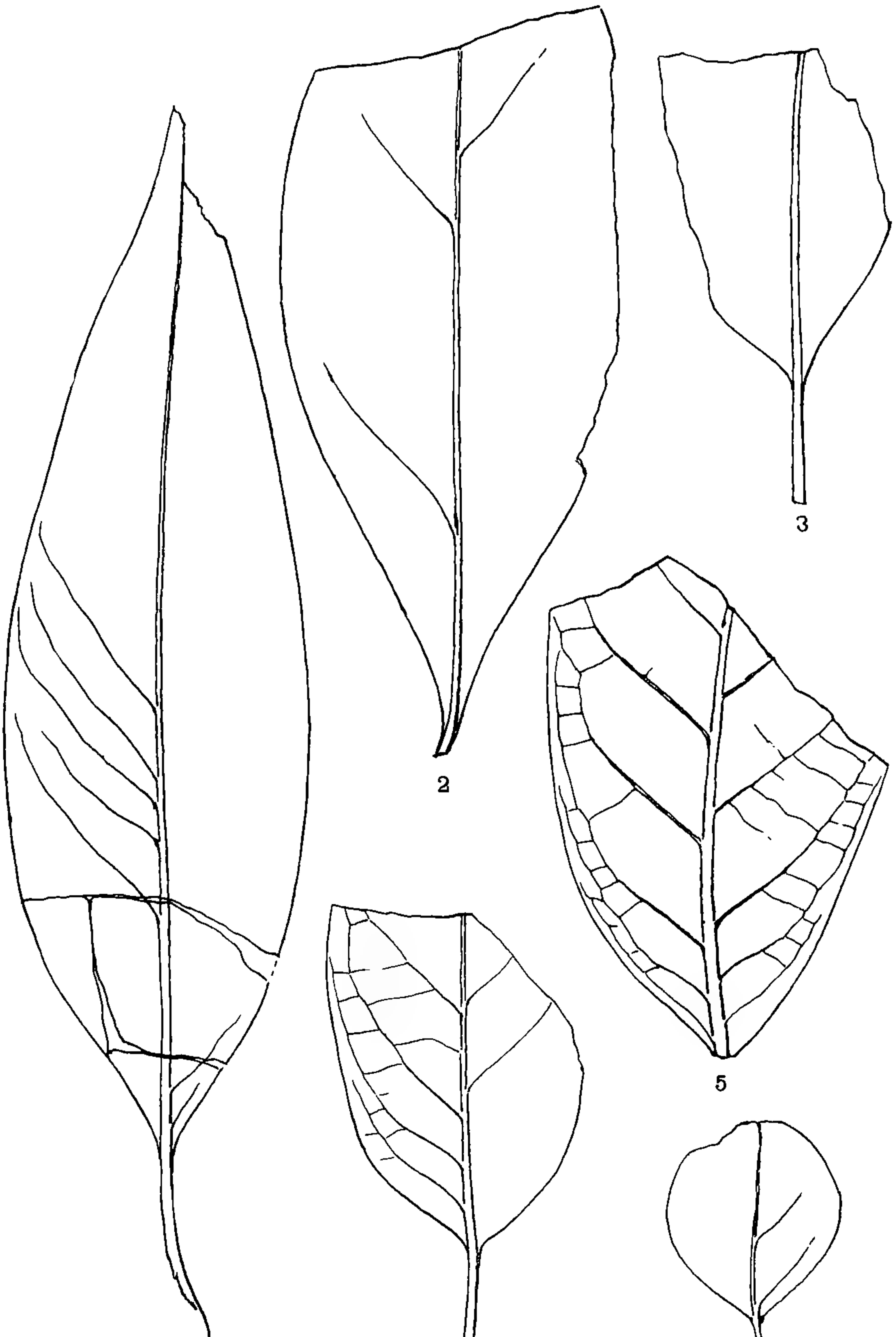

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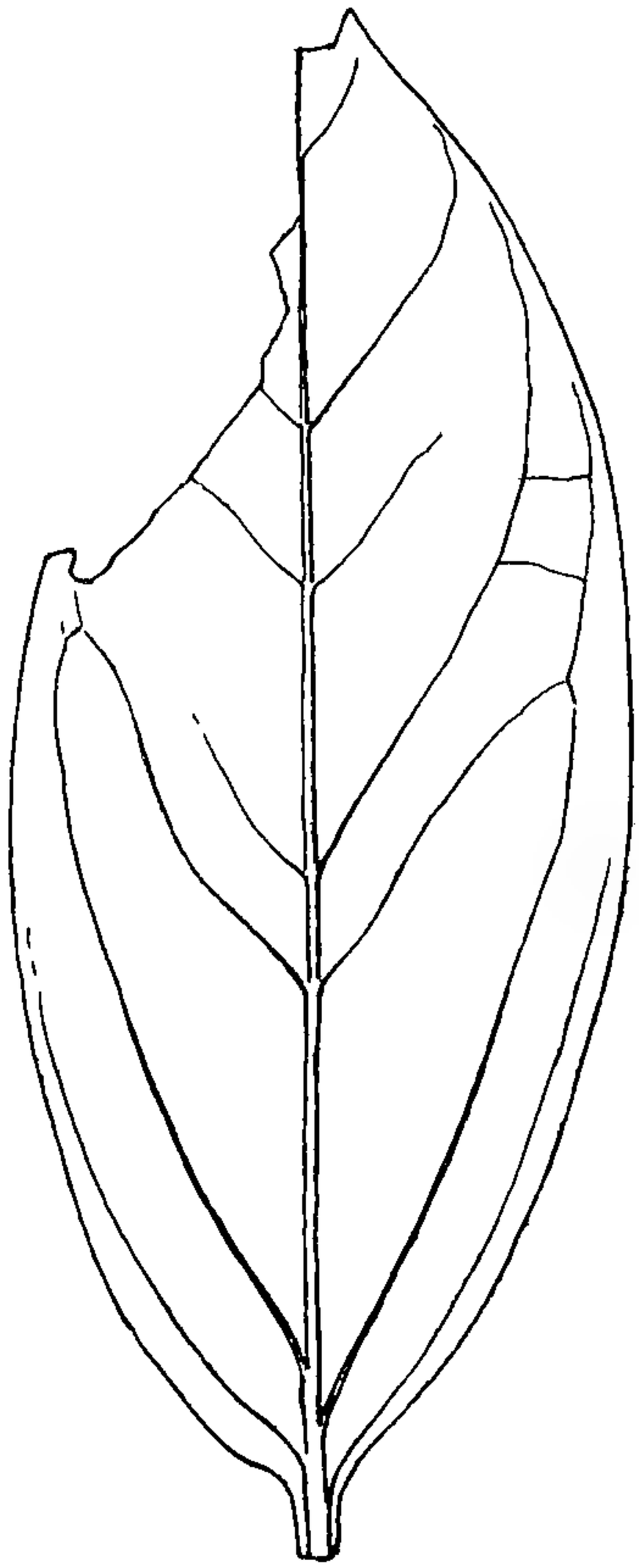

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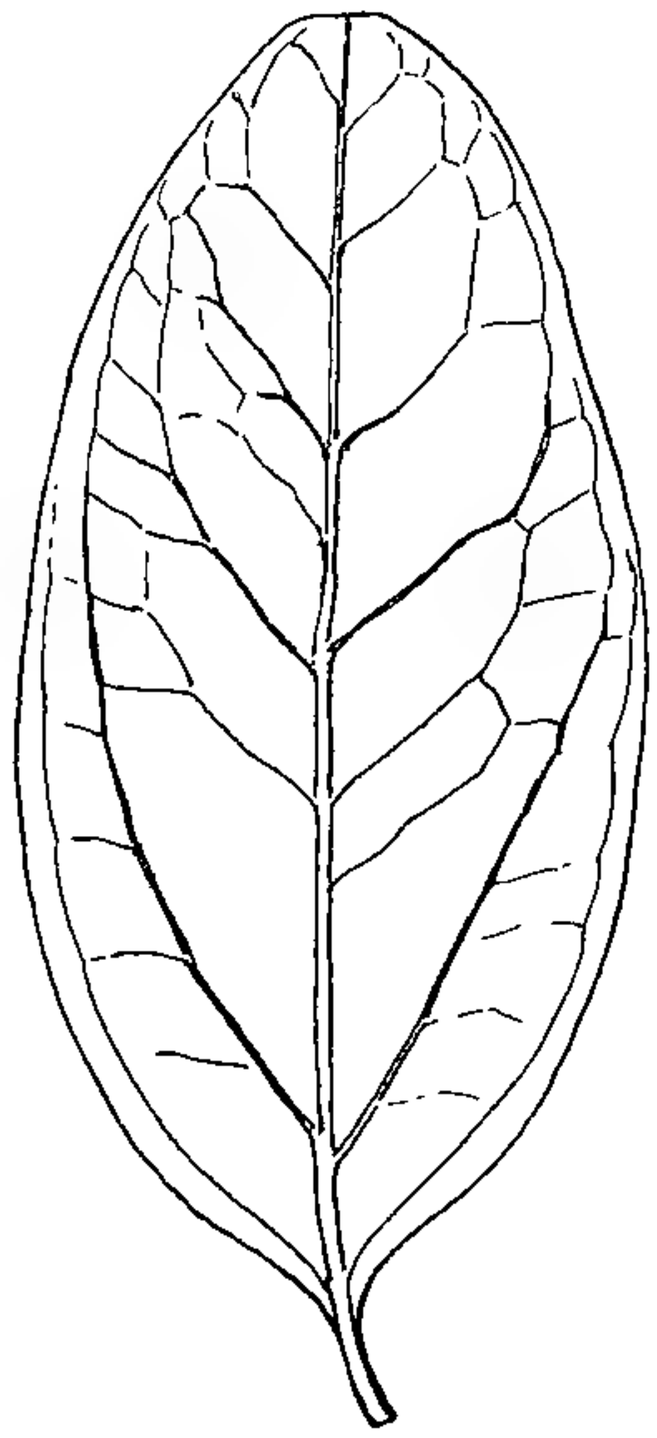

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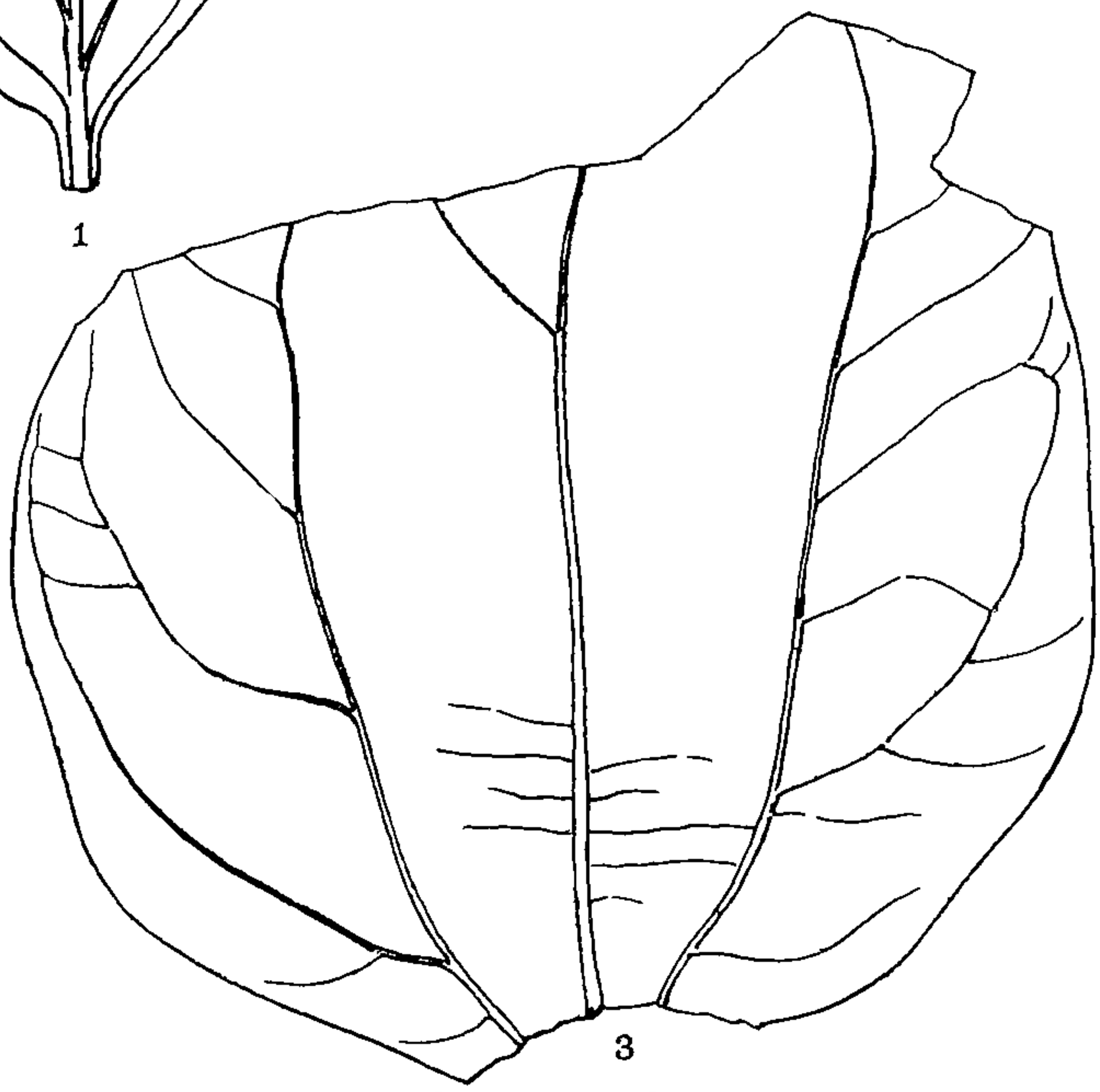

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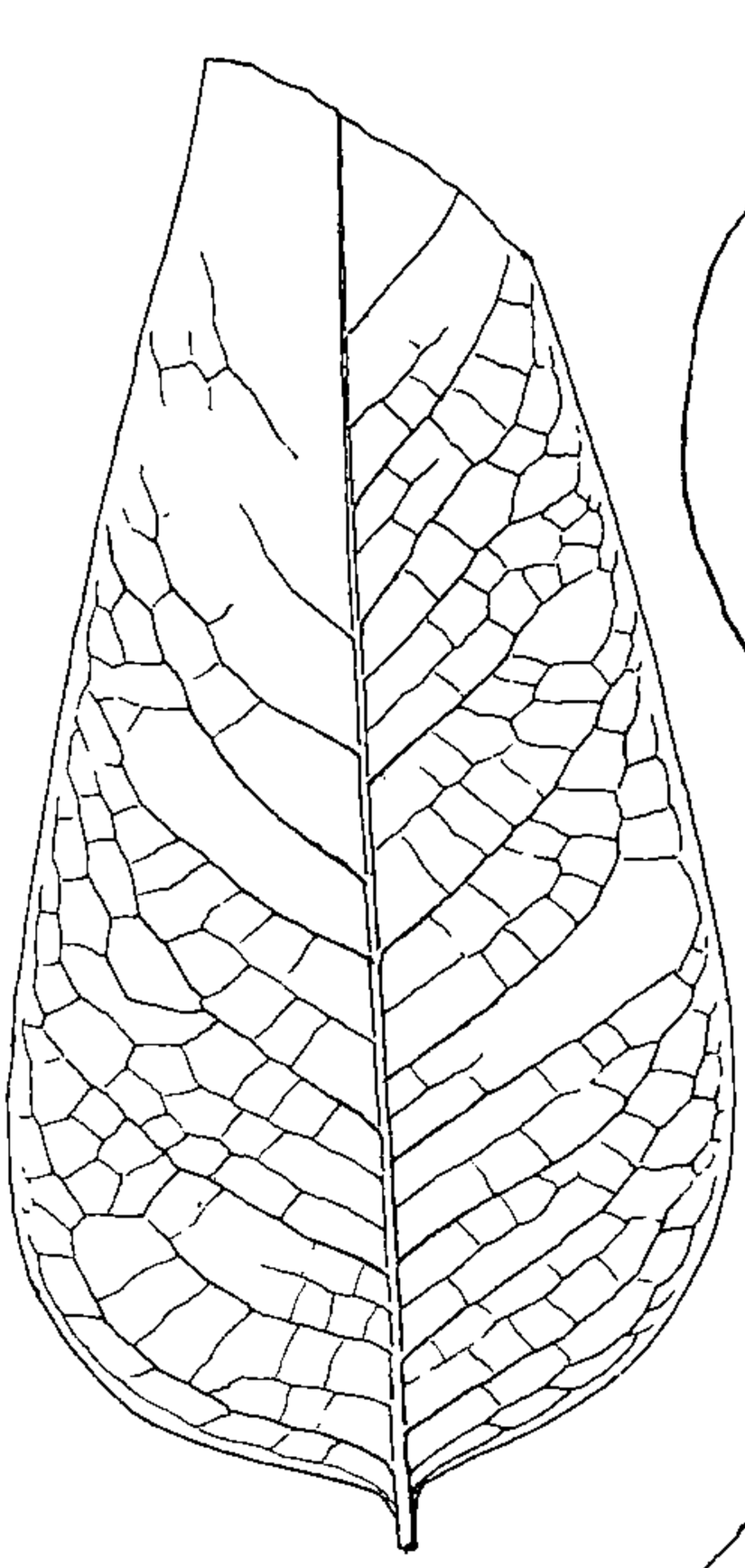

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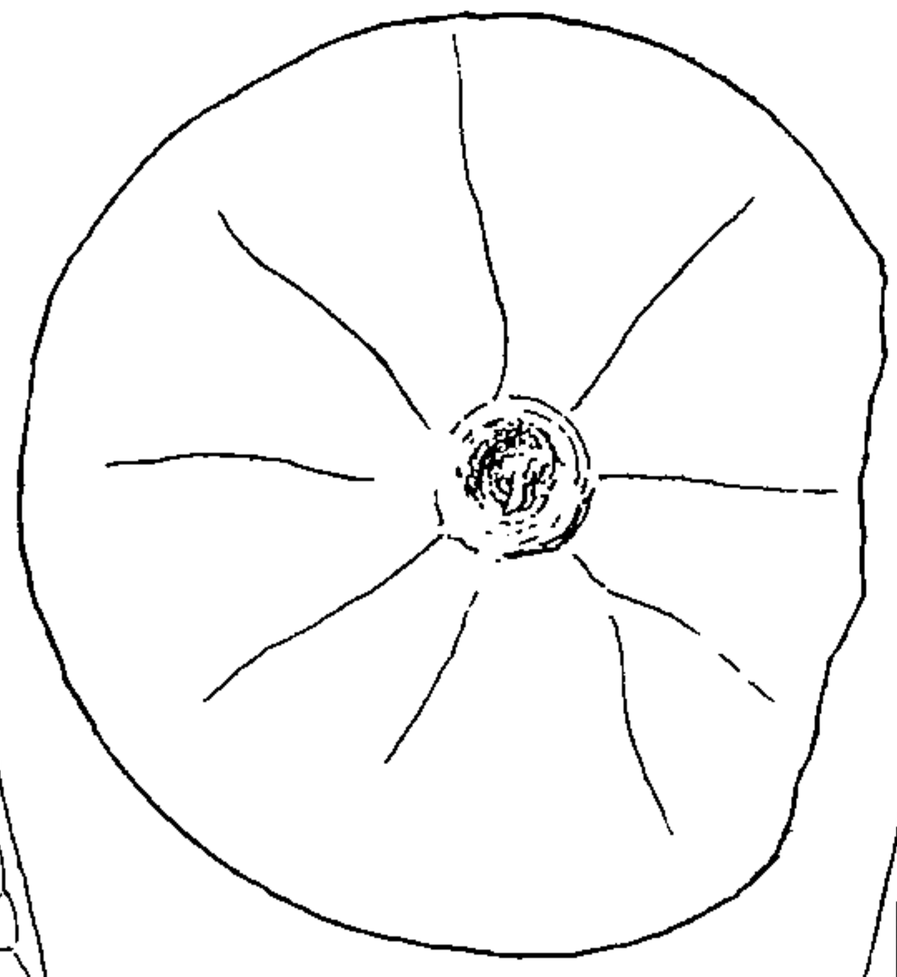

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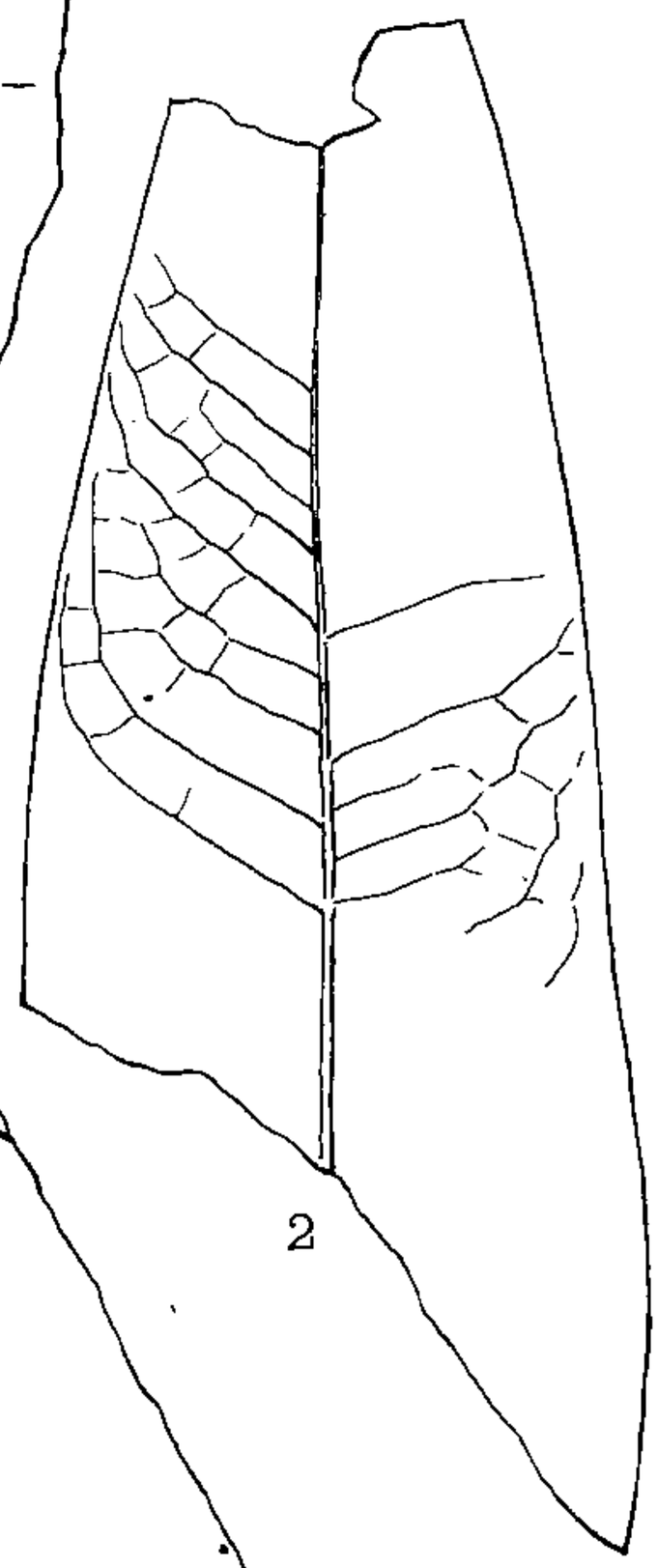

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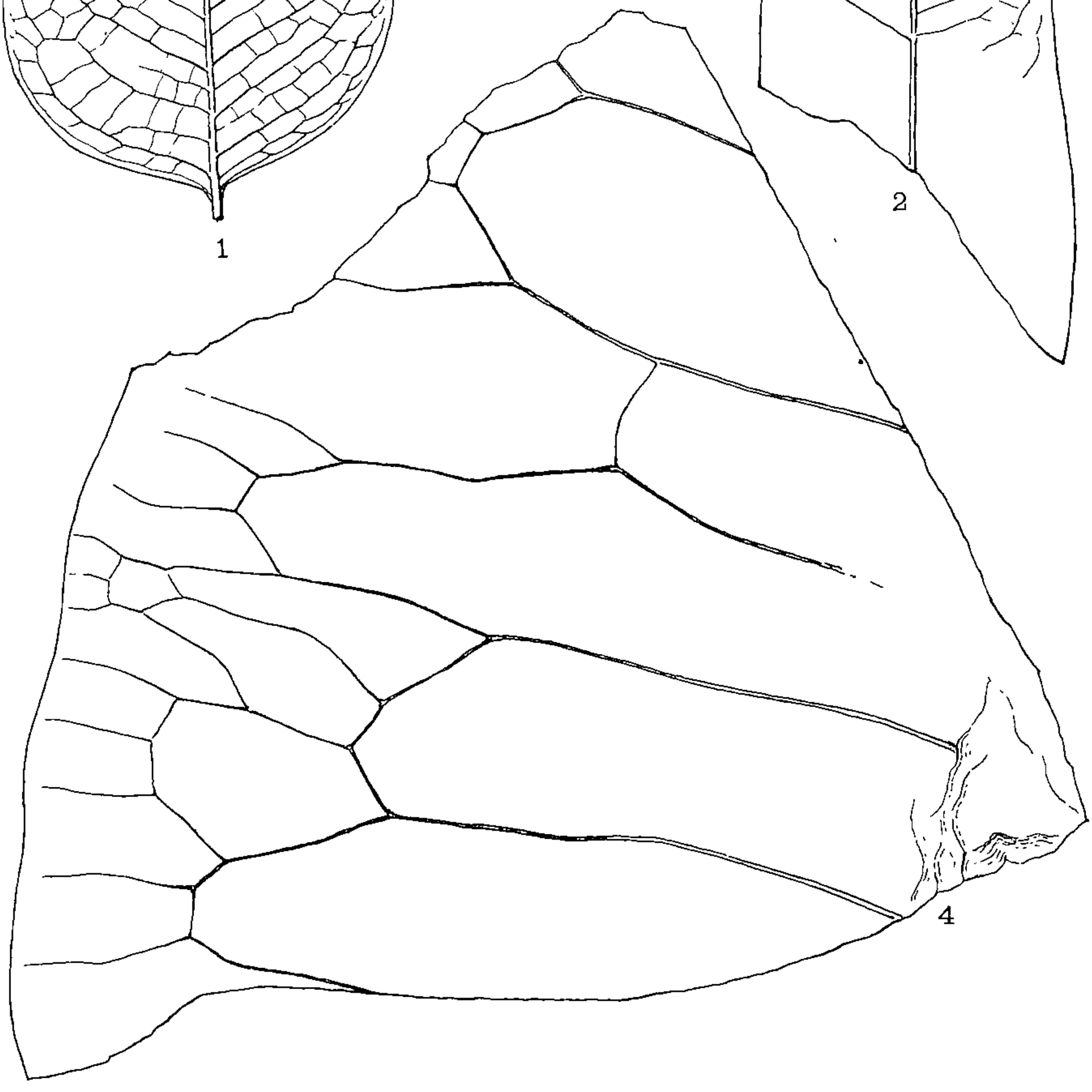

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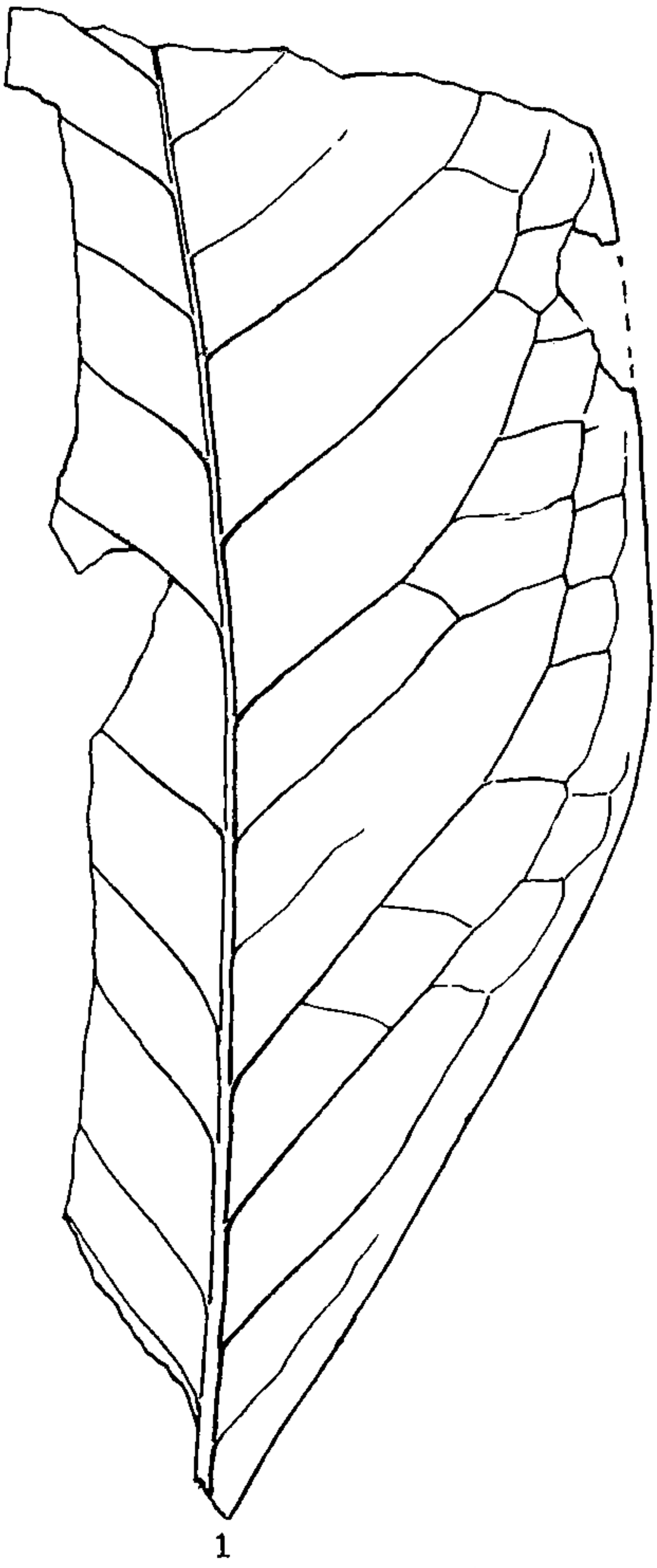

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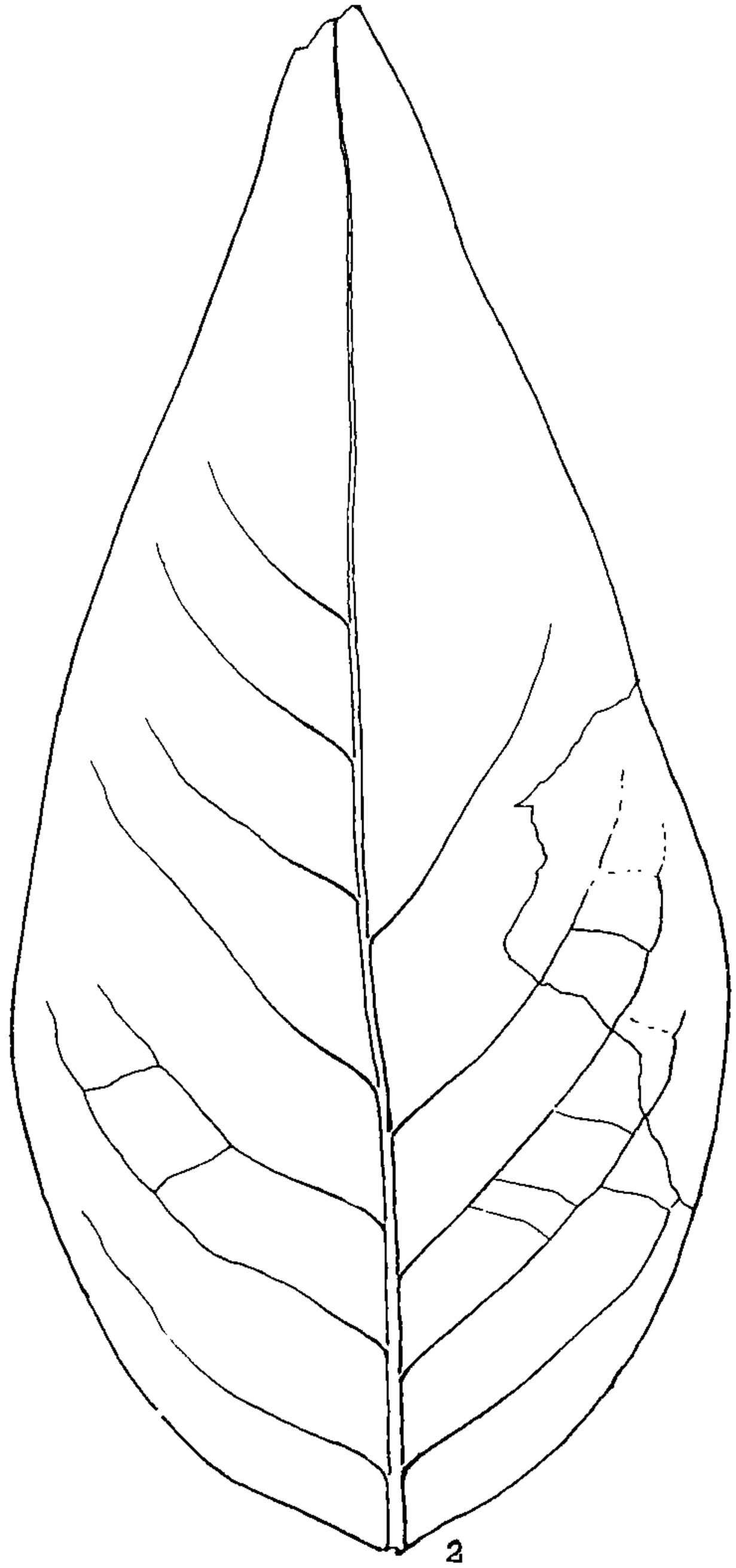

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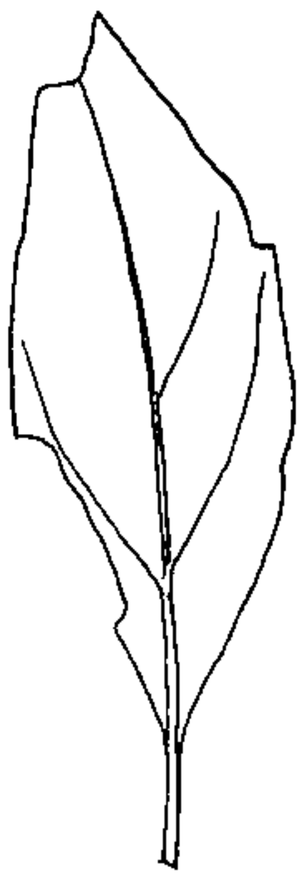

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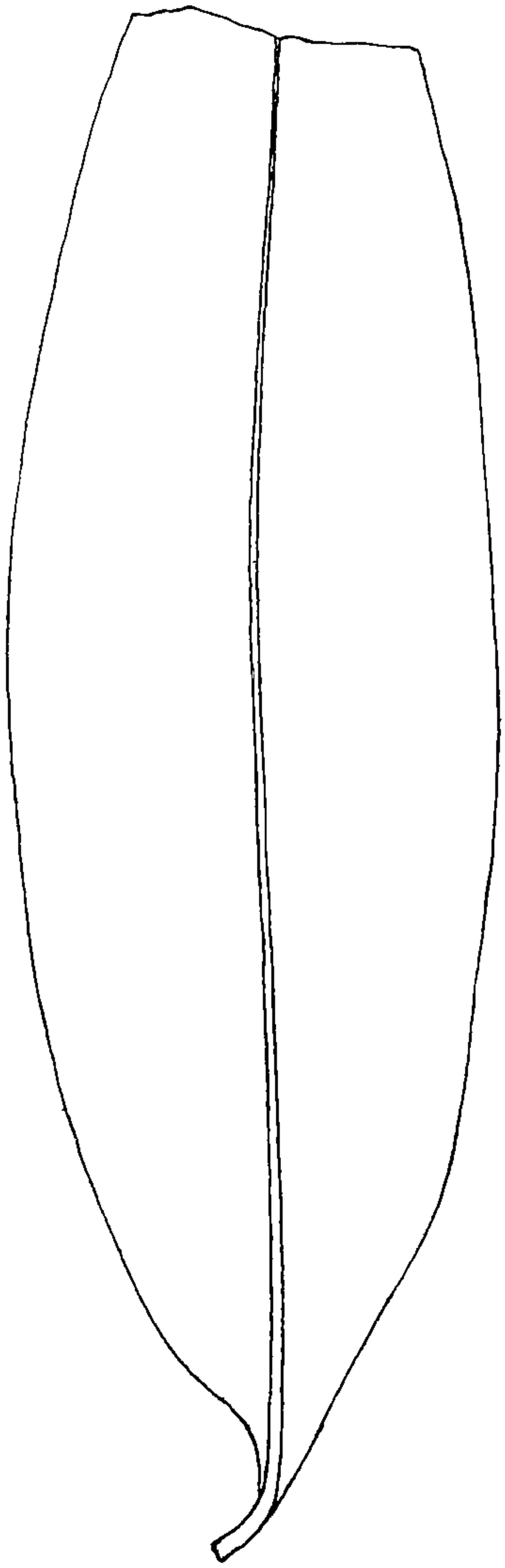

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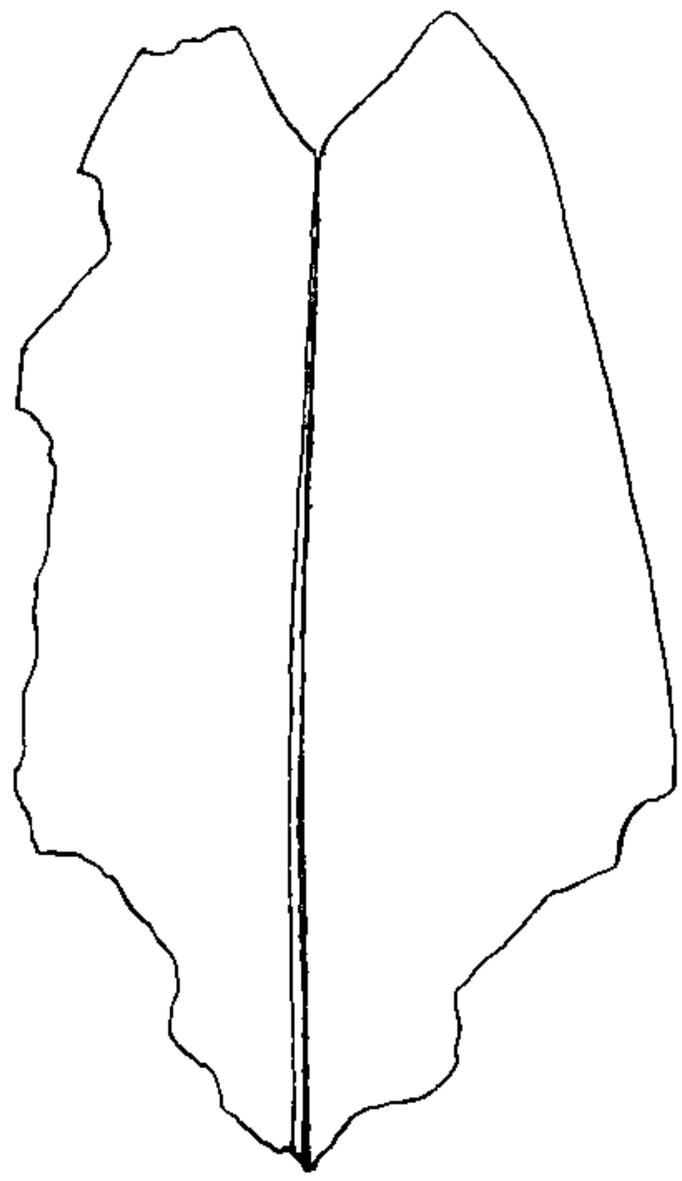

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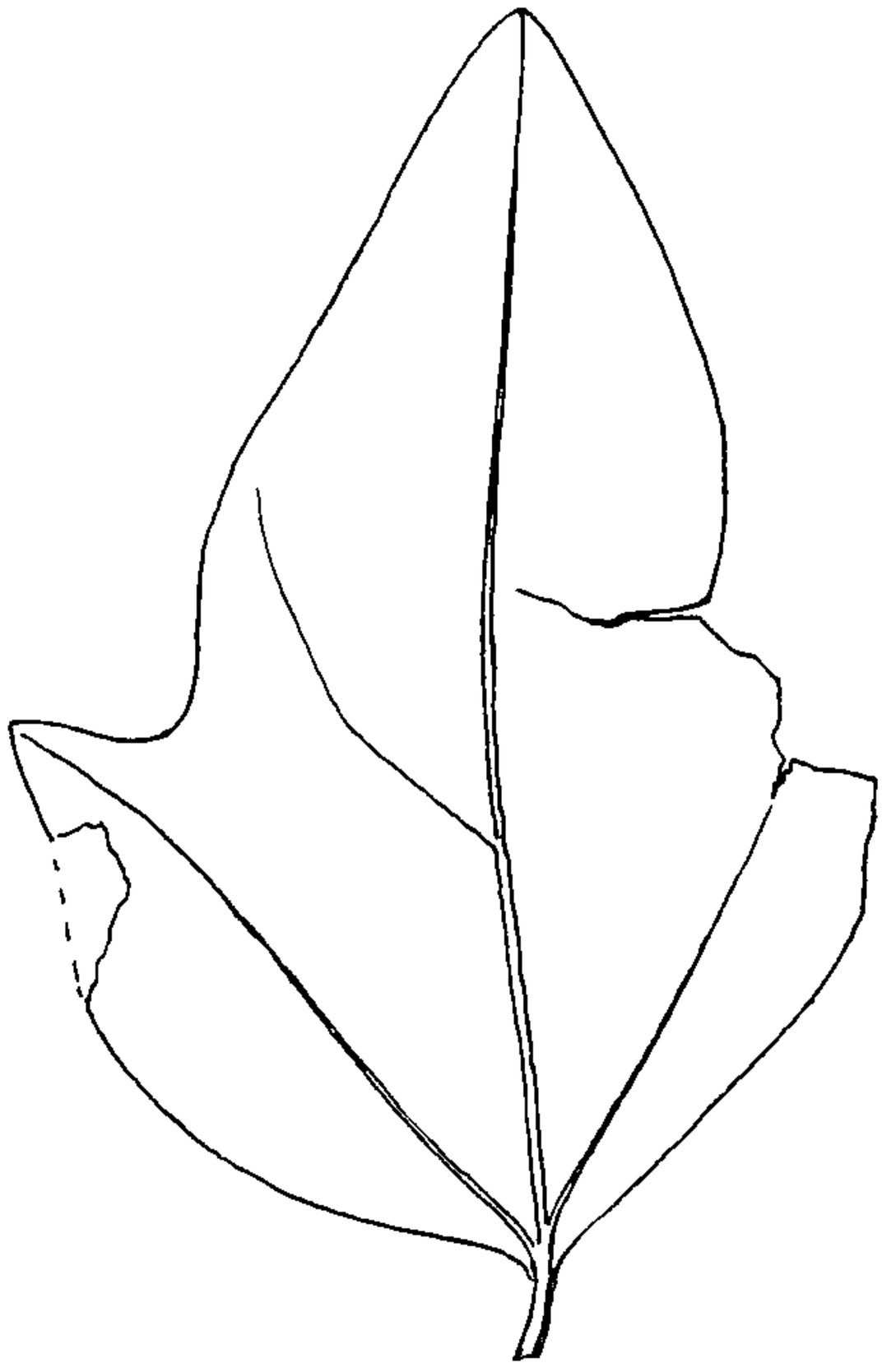

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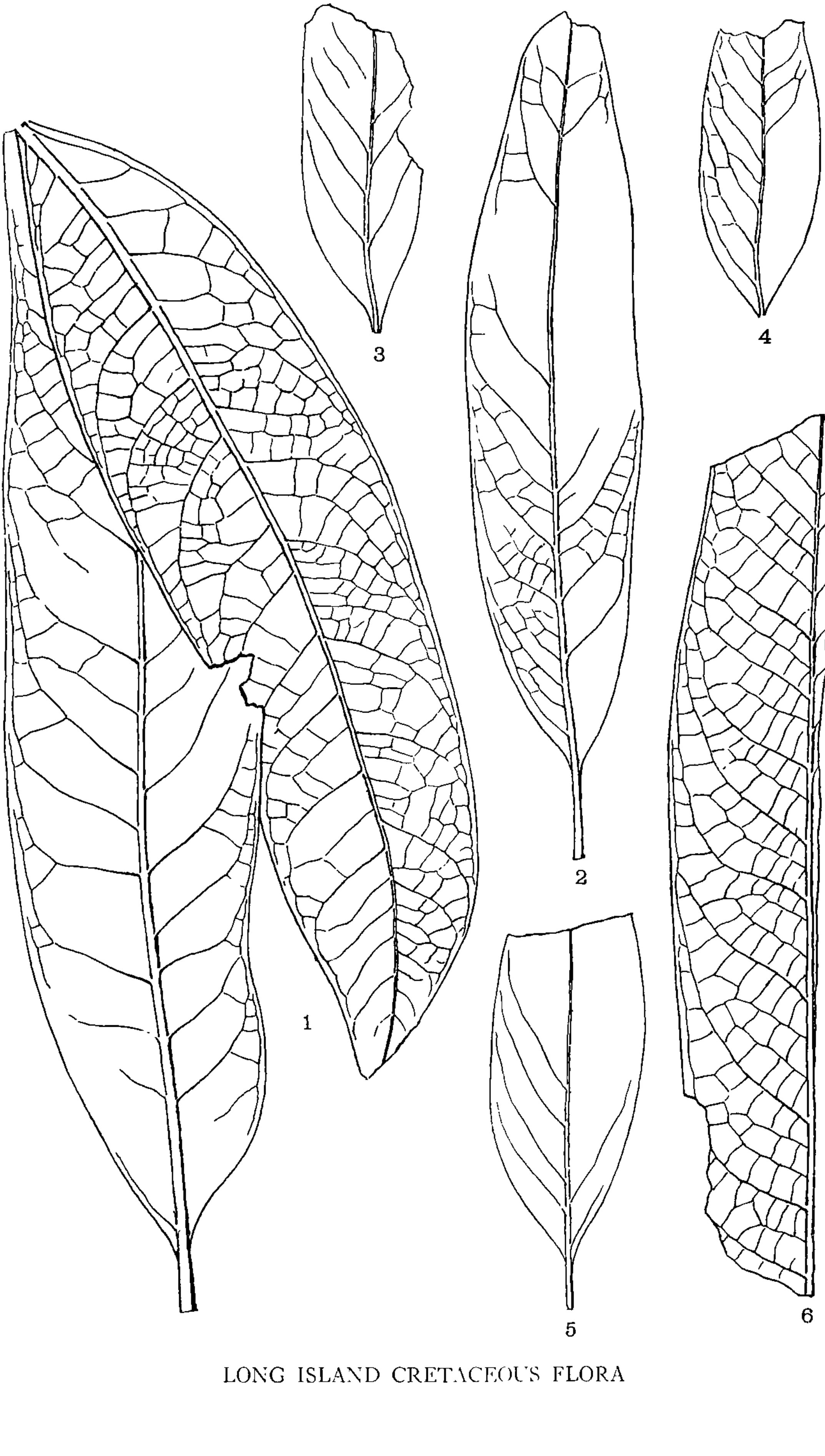
LONG ISLAND CRETACEOUS FLORA



LONG ISLAND CRETACEOUS FLORA

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VOL. 8 NO. 29

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN

[ISSUED MARCH 18, 1913]

CONTENTS:

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1912 171

Report of the Assistant Director 185

Report of the Head Gardener 192

Report of the Head Curator of the Museums and Herbarium 197

Report of the Honorary Curator of the Economic Collections 204

Report of the Director of the Laboratories . . . 206

Report of the Librarian 212

Report of the Superintendent of Buildings and Grounds . 214

SCHEDULE OF EXPENDITURES DURING THE YEAR 1912 . . 218

REPORT OF THE CHAIRMAN OF THE SCIENTIFIC DIRECTORS . 228

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS FOR THE YEAR 1912 232

REPORT OF THE TREASURER FOR THE YEAR 1902 . . . 246

REPORT OF THE SPECIAL AUDITOR 250

BULLETIN
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The New York Botanical Garden

Vol. 8. No. 29.

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1912

(*Accepted and ordered printed, January 13, 1913*)

To the Board of Managers of the New York Botanical Garden.

Gentlemen: I have the honor to submit herewith my report as Secretary and Director-in-Chief for the year ending January 13, 1913.

Construction work has been continued during the year by means of city appropriations aggregating $49,800, made in 1911, and by small unexpended balances of previous city appropriations. No new city appropriations for construction were made during 1912. Some minor works were accomplished by the labor force under pay from appropriations of Garden funds.

Grading, drainage and the construction of additional paths have been continued; the additional greenhouse at public conservatory range no. 2, the contract for which was awarded late in 1911, was completed during the summer; work on the construction of the boundary fence and wall along the Bronx Boulevard on the eastern side of the grounds, commenced during the summer through a Park Department contract, has been continued and the work is now about one half completed, the contractor having been exceedingly dilatory and having already been favored by one extension of time; a pergola on the east side of the herbaceous garden has been under construction for several months and is about two thirds finished; two retaining walls at the Bedford

Park Avenue entrance were commenced by a contractor during late summer and are still unfinished, this contractor also having far exceeded his specified time. Altogether, the experience during the last year with these contracts has been disappointing, but the work so far accomplished with them is of good quality, and it is hoped that all the work under contract may be completed in the spring. The collections in all departments have been materially increased by gifts, purchases and exchanges. The older plantations have been maintained and, in some cases, slightly modified by addition and substitution, and additional plantations have been established. Direct educational work with the public has been continued by means of lectures and by docents, and nature-study lectures and demonstrations to children from the public schools have been given. Advanced students have carried out researches over a wide range of subjects, and members of the staff have accomplished considerable investigational work. The publications have been continued. The number of visitors has apparently been greater during 1912 than during any previous year.

Grading and Drainage

The knoll of rock just north of the museum building has been further leveled and the rock used for the Telford foundations of paths in various parts of the grounds, so that not much of it now remains; earth and top soil for forming the final surface here has been brought from points within the grounds where it was not needed, and some top soil has been carried here by contractors from without the grounds for the privilege of dumping. Considerable progress has been made on the north side of the approach to the Woodlawn Road entrance by permitting contractors, without cost to the Garden, to dump surplus earth and rock into the marsh which existed there; and the subsurface for paths and planting has also been mostly accomplished in this way. Some 15,000 cubic yards of material having thus been obtained during last year and the year

before, little of the marsh is now remaining. Filling has been accomplished at several points in the north meadows, in continuation of the elimination of marshy areas there. The old reach of the Bronx River south of the east end of the Boulder Bridge, partly reclaimed in former years, was nearly completely reclaimed. Considerable grading was done around power house no. 2 on the east side of the grounds, and along the river road and path on the east side of the Bronx River north of the Long Bridge.

Additional drain-pipe was laid and additional catch-basins built at several points.

Roads and Paths

The only piece of new road constructed was about 150 feet along the eastern side of the propagating houses. The new road through the arboretum, mentioned as nearly completed in my last two annual reports, remains unfinished, although material for its surfacing, all that is now required to open it to the public, has been at hand. The delay in opening it has been caused by the entrance at the south-eastern corner of the grounds, which has been used both for this driveway and for the driveway running southwest through Bronx Park, soon passing south of the boundary of the Garden, being as yet unfinished, and also by the fact that the Bronx Boulevard, bounding Bronx Park to the east, has not yet been paved. We have hesitated about opening this new road before the paving of the Bronx Boulevard is accomplished, because it would turn vehicles abruptly from a stone road on to a dirt surface, which in wet weather becomes very muddy. Not more than two weeks' work with a steam roller and a gang of men and a few carts will be necessary to complete this road when the proper time arrives.

About 2,000 lineal feet of paths 10 feet wide have been completely built and opened during the year, and over 3,600 feet of paths averaging 10 feet wide, of which the Telford foundation was previously laid, have been surfaced

and opened to the public. Considerable areas of paths built in previous years which had become worn were resurfaced, and the system of paths, so far as completely constructed, is now in good condition.

The path system as planned is now approximately four fifths completed, and of the one fifth remaining, nearly one half is partially built. We shall have to wait for additional city appropriations for the means to finish the system, inasmuch as available funds have now been exhausted.

The guard rails placed along path edges in previous years have served to protect natural woodlands and thickets and grass-borders in a satisfactory manner. These have been supplemented during the past year by about 10,000 running feet of similar railing in various parts of the grounds. Much more of this railing is required for the complete protection of all places requiring it, and an appropriation for this purpose has been asked from the Board of Estimate and Apportionment.

During the summer, the Park Department was able to restore the badly worn driveway surfaces and, at present, the roads are all in relatively good condition. This repair work has been highly appreciated by all who have used the driveways.

Bridges

The three stone driveway bridges and the Boulder Bridge are all in good order, having been pointed during the year where necessary. At some time when funds are available it is desirable that the curb lines of the Long Bridge be reset, because by the settlement of the filling between the arches the curb stones have been moved slightly out of a true curve.

The plan for the additional permanent foot-bridge required near the southern end of the north meadows, presented at the last annual meeting, was subsequently approved, and may be constructed when an appropriation is made for this purpose by the city. Meanwhile the chestnut bridge built on this site will serve.

The old wooden bridge below the water-fall, mentioned in my last annual report as now unnecessary since the building of the concrete bridge across the Bronx gorge nearby, has not yet been removed, but may be at such time as the Commissioner of Parks agrees to its demolition.

Water Supply

No change has been made during the year in the water supply system, inasmuch as no funds have been available for its extension. In our application for additional construction funds made a year ago, an item of $2,000 was included to provide funds to complete all necessary water supply to grounds and buildings, and when this sum becomes available the system may be completed.

Buildings

As the buildings become older, the necessary annual maintenance expenses increase. This is notably the case in the steam distribution system, aggregating many miles of piping. Almost the entire appropriation for repairs and renewals was required last year for this work; and replacements of steam pipe must go on continuously. A larger appropriation is available for this year. Part of the repairs necessary are made by our steam engineers, but we are obliged to call in help to remedy any serious breakdown.

Provision is also made in the appropriation for 1913 for pointing portions of the museum building and resetting a part of its terra-cotta cornices. Interior painting of the museum halls has been continued and much painting has been accomplished on portions of the greenhouses and on fences and guard rails.

Taken as a whole all structures are in reasonably good condition, and such defects as now exist should be mainly remedied by the expenditure of funds available during 1913.

Plants and Planting

Maintenance and development of the older plantations have been satisfactorily accomplished and material additions

have been made to the number of kinds of plants represented, there being now about 13,170 different kinds of plants represented in the collections, of which about 8,750 kinds are under glass and the remainder in the open.

Noteworthy new plantations include a large collection of peonies along the bottom of the west end of the terrace at conservatory range no. 1; the enlargement of the conifer plantation at the west end of the Long Bridge; a collection of lilacs received from the Buffalo Botanic Garden, planted at the foot of the Bronx Boulevard retaining wall, near the arboretum collection of ash trees; a choice collection of lilacs presented by Mr. T. A. Havemeyer, Jr., planted near the lower end of the museum approach; and the plantation of selected thorn trees in the west border near the Upper Lake. Ground has been prepared at the east end of the terrace of conservatory range no. 1 for a rose garden to be planted in the spring. The labeling of plants has been continued throughout the year, over 4,700 labels having been painted and put in place. The lead-faced label used in previous years has been abandoned, much to our regret, because large quantities of them were stolen, the lead melted off and sold by thieves. Some of the thieves were apprehended, but the damage was continued. It was deemed best to substitute for the lead-faced label one which would not excite cupidity, and most of the labels made this year are of zinc with an aluminum finish. Up to the present time these have not been stolen.

The additional plants brought into the collections have been obtained by exchanges with other institutions; by exploration work in the West Indies, and by purchases made possible through the following contributions to the Plant Fund.

John D. Archbold	$300
W. Bayard Cutting	100
Charles G. Thompson	100
Mrs. Frederick F. Thompson	100
Louis C. Tiffany	100

Natural Features

The beauty of the Garden reservation has suffered no deterioration during the year, and the protection of the woodlands and thickets by guard rails along paths and trails has permitted the wild plants to recover some areas which had become trampled by visitors. Hemlock and hickory trees have suffered from depredations of the bark-borers, and a considerable number of both these kinds of trees have died. The only practicable remedy which has been found is to remove the dead trees as rapidly as possible. No spraying or other mode of treatment has been found at all effective, and the damage must, apparently, proceed until some natural check to the development of these insects appears. If it were possible to induce more woodpeckers or other birds of similar habits to those of woodpeckers to remain in the woodlands, the number of borers would be materially reduced. However, there are far more young trees coming up in the woodlands than there were old ones destroyed.

Additional patroling by police officers provided by the Police Department during the year has been advantageous in many ways, and it will be possible this year to somewhat increase the number of guards employed.

Museums

Additional specimens, obtained from a wide range of sources, have been installed throughout the museum series of exhibits. No modifications have been made in the general plan of the series of exhibits,—the collection of fossil plants occupying the basement of the museum building, the economic museum the main floor, and the systematic museum the second floor. Additional cases recently obtained for the economic museum through a city appropriation will permit the installation of a large number of specimens held in storage. More cases are needed for specimens now available for installation on all three floors, and a further appropriation for cases has been asked.

Herbarium

The herbarium collections have been increased by over 30,000 specimens, about half of which were obtained through exploration work, and half by gift, purchase and exchange. Additional cases were built during the year and more will be needed soon to properly conserve this invaluable collection, which now aggregates about 1,500,000 specimens.

Purchases of museum and herbarium specimens were made possible by the following contributions to the special fund for educational and scientific purposes.

James B. Ford	$500
Addison Brown	300
Mortimer L. Schiff	200
Edward V. Z. Lane	100
Miss Helen M. Gould	100
Myles Tierney	100
Mrs. Morris K. Jesup	100

Library

The library now contains 24,024 bound volumes,—an increase of 446 bound volumes during the year. The additional steel shelving obtained in 1911 is sufficient for the growth of this collection for several years. The library has been mainly brought together by exchanges and by purchases made possible by gifts of money from many friends. During 1912, the following contributions made to the special fund for educational and scientific purposes were used for library purposes.

Andrew Carnegie	$1,000
Henry Phipps	500
H. C. Frick	500
John I. Kane	300
George S. Bowdoin	200
N. L. Britton	200
James A. Scrymser	200

Miss Elizabeth Billings	100
Thomas H. Hubbard	100
Archer M. Huntington	100
James Speyer	100
Arthur F. Estabrook	100
Samuel Thorne	100
Adrian Iselin, Jr.	100
Mrs. E. H. Harriman	100
Louis Marshall	100
Robert W. de Forest	50
James Douglas	50
Cleveland H. Dodge	50
William D. Sloane	50
Edward D. Adams	50

There still remains a large number of important works on botany and horticulture to be secured before the library attains completion in the older literature. Many of these are rare and obtainable only at intervals. It is most desirable that financial provision should be made which would enable us to obtain any book offered for sale which is not represented in the collection.

Laboratories

Laboratory facilities have been granted to 19 advanced students during the year, all pursuing different lines of investigation. No material changes have been made in the equipment. The Director of the Laboratories has prosecuted extensive experimental work in plant breeding at the nurseries and has guided the investigations of students in that subject. This work will be continued and extended during 1913. The tropical laboratory at Cinchona, on the Island of Jamaica, rented ten years ago by the Garden for experimental purposes and held as a convenient place for studies by botanists, has not been sufficiently utilized recently to warrant us in continuing the lease from the Jamaica Government, and it is now proposed to terminate

this lease, with the hope, however, that the station may be continued as a point where investigations may be prosecuted under other auspices.

Public Instruction

Saturday afternoon public lectures were delivered from April 27 consecutively until December 14. Thirty-four lectures were given and an average attendance of 100 was maintained to the end of the course, which was carried six weeks later into the year than in previous seasons. Lectures and demonstrations to public school children, supplementary to their nature-study curriculum, were given in the autumn. Docentry work has been continued throughout the year, the plan of providing a docent at three o'clock every week day afternoon to accompany visitors through parts of the grounds and buildings proving entirely satisfactory. Members of the staff acting as docents have also accompanied many parties of visitors, both children and adults, at other times, and this system of personal guidance is of high educational value. More complete labeling of all collections, which is being gradually attained, makes these of increasing importance educationally.

Floral Exhibitions

Cooperation with the Horticultural Society of New York in providing monthly public exhibitions of plants and flowers was continued during the summer, the exhibitions being opened to the public on Saturday afternoons and continued during the following Sundays. In some of these exhibitions the whole basement floor of the museum has been filled with flowers; at others only one of the halls was used.

Exploration

Botanical exploration and collecting in Cuba was continued in the early part of the year by Dr. J. A. Shafer, Special Agent, and, accompanied by Mr. John F. Cowell, Director of the Buffalo Botanic Garden, and by Mrs.

Britton, I spent the month of March and part of April in eastern and central Cuba. Our representation of the Cuban flora, while not yet complete, is now greater than that of any other institution. The difficult region of the high Sierra Maestra, west of Santiago, still remains unexplored. It is hoped that at some time a party may be organized to spend several months in those high mountains, which are known to contain many rare species, and doubtless contain many others as yet unknown to science. During parts of November and December, Dr. John K. Small, Head Curator of the Museums, accompanied Professor Hugo de Vries on a collecting trip through southern Florida, in continuation of his investigations of the flora of that region. Three weeks in late August and early September and two weeks in December were given by me to studies in Bermuda, accompanied on the first trip by Mr. Stewardson Brown, Curator of Botany at the Philadelphia Academy of Natural Sciences, and by Mrs. Britton, and on the December trip by Mr. Stewardson Brown, and by Dr. Seaver of our staff. This exploration work has been aided by contributions of money to the special fund for educational and scientific purposes applied to exploration, as follows:

W. K. Vanderbilt	$500
J. Pierpont Morgan	500
N. L. Britton	300
E. S. Harkness	250
George F. Baker	200
Edward D. Adams	200
George W. Perkins	200
H. C. Fahnestock	200
Cleveland H. Dodge	100
John E. Parsons	100
Francis Lynde Stetson	100
Edgar L. Marston	100
Walter Jennings	100
William J. Matheson	100

Henry W. de Forest 100
William D. Sloane 100
Jacob H. Schiff 100
Emerson McMillin 100
M. F. Plant 100
Miss Catherine A. Bliss 100
Ogden Mills 100
H. C. von Post 100
Isaac N. Seligman 100

A large number of the plants obtained during previous expeditions, and others grown from seeds thus obtained, have now reached full development and are noteworthy specimens in the grounds and greenhouses. The study of museum and herbarium specimens obtained is going forward continually, and extensive additions to knowledge are being made through these studies. It is most desirable that this work be continued and that financial provision be made therefor.

Investigations

Research over a wide range of subjects has been prosecuted by advanced students and by visiting officers of other institutions. The members of the Garden staff have devoted such time as could be spared from administrative and curatorial duties to investigation, and have extended these studies beyond regular hours of attendance. Substantial additions to knowledge have been made, but much more could be accomplished by a larger staff, the collections and facilities of the Garden providing opportunities for much more research work than it is possible to accomplish at present. Several students have been aided by scholarships and by grants from the income of the Students Research Fund. Further financial provision for scholarships would be highly advantageous.

Preservation of Native Plants

The proposition mentioned in my last annual report to use the accumulated income of the fund of $3,000 presented

to the Garden by the Misses Caroline and Olivia Phelps Stokes, for the illustration in color of certain wild flowers needing protection from indiscriminate picking, was carried out by the publication in the Garden JOURNAL during the year of colored plates, illustrating jack-in-the-pulpit, spring beauty, wild pink, wild columbine and bird's-foot violet, reproduced from paintings by Miss Mary E. Eaton, who has also made paintings of other plants needing preservation. The income of this fund will enable us to publish three more subjects in this year's JOURNAL. A considerably larger edition of the plates than the number needed for the JOURNAL was printed, and it is proposed, after eight subjects have been illustrated, to group these in frames and distribute them to schools.

The Charles Finney Cox Memorial Collection of Darwiniana

At a meeting of the Board of Managers held January 30, 1912, it was resolved that a permanent memorial of the late Charles Finney Cox, who served the Garden for many years as treasurer, be established, and it was subsequently ascertained that the important collection of books and other documents relating to Charles Darwin, which had been accumulated by Mr. Cox, could be purchased. This purchase was accomplished by contributions from the following friends of Mr. Cox and of the Garden.

W. K. Vanderbilt	$1,000
Andrew Carnegie	1,000
J. Pierpont Morgan	800
James B. Ford	500
George F. Baker	100
W. H. Newman	100
Robert W. de Forest	100
John D. Archbold	100
Edward S. Harkness	100
James Speyer	100
Walter B. Jennings	100

William J. Matheson	100
Louis C. Tiffany	100
Thomas H. Hubbard	100
J. D. Cox	100
Edward A. Wickes	100
Chauncey M. Depew	100
W. H. Canniff	100
N. L. Britton	50
Edward A. Adams	50
John Innes Kane	50
Samuel Thorne	50
Cleveland H. Dodge	50
William D. Sloane	50
Edgar L. Marston	50
Joseph E. Brown	25

The collection will be described in detail in the January issue of the Garden JOURNAL. It is one of the most important acquisitions from educational and scientific standpoints that the institution has ever received. A case for it, now under construction, will be placed in the library.

Administration

I have been aided in administrative duties during the year by Dr. W. A. Murrill, Assistant Director, and by Mr. R. S. Williams, Administrative Assistant. I have supervised all new construction work, and this has also been under the observation and direction of Mr. Arthur J. Corbett, Superintendent of Buildings and Grounds. I have also supervised the installation of additions to the collections, which are under the immediate care of Mr. George V. Nash, Head Gardener, and of Dr. John K. Small, Head Curator of the Museums and Herbarium. Such time as could be spared from these duties has been given to studies of the North American flora and to cooperation with Dr. J. N. Rose, of the Carnegie Institution of Washington, in investigations of the cactus family.

Financial Considerations

The city appropriations for maintenance of grounds, buildings and collections for 1913 aggregate $103,900. To provide for a satisfactory scale of maintenance and for proper remuneration of employees, it is necessary to supplement these city allowances by about $25,000 from Garden income, which now amounts to about $30,000 annually, leaving only about $5,000 available for the increase of the collections and other scientific and educational work. It is, therefore, very desirable that additional income be obtained, in order that the institution may attain its proper place in science and education. At the meeting of the Board held November 14, 1912, a committee was appointed to secure additional permanent funds, and this committee is endeavoring to obtain subscriptions aggregating not less than $100,000 during the year 1913. The aid of all members and friends of the Garden is asked for this committee.

Reports Appended

Reports describing in detail the work accomplished during 1912 are submitted, prepared by the Assistant Director, the Head Gardener, the Head Curator of the Museums and Herbarium, the Honorary Curator of the Economic Collections, the Director of the Laboratories, the Librarian, and the Superintendent of Buildings and Grounds; and a schedule of expenditures is submitted by the Accountant.

Respectfully submitted,

N. L. Britton,

Director-in-Chief.

REPORT OF THE ASSISTANT DIRECTOR

Dr. N. L. Britton, Director-in-Chief.

Sir: I have the honor to submit the following report for the year 1912.

Grounds and Buildings

The grounds and buildings have been kept in good condition during the year; but it has been impossible to maintain

the highest standard with the funds available. Damage from fire and storm and disorderly persons has, fortunately, been slight. The seasons have been unusual in many respects. The winter was severe and very destructive to vegetation, especially to evergreens. An account of the losses sustained in our plantations was given by Mr. Nash in the July JOURNAL. An exceptionally heavy flood in the Bronx River, described in the April JOURNAL, occurred March 13, but the damage done was largely confined to scattered rubbish deposited over the meadows. The usual summer drought occurred much earlier in the season than for several years past, while frequent showers fell later in the year. The autumn was the mildest and most beautiful known in the history of the Garden.

Insect pests have been much in evidence during the year, and considerable time has been devoted to them by Dr. Seaver. His paper on the leopard-moth in the October JOURNAL is to be followed by others on some of the most destructive insects found on the grounds. An epidemic of white grubs, which greatly injured the lawns in many places, was described by the writer in the JOURNAL for September.

Public interest in the Garden increases every year, and visitors are now realizing more than ever before the aims of the institution and the need of their cordial cooperation.

The details of maintenance of the grounds and buildings are outlined in the reports of the Head Gardener and the Superintendent of Buildings and Grounds.

Publications

JOURNAL

The JOURNAL has been published for each month during the year, making a volume of 215 pages, with 23 plates, 5 of which are colored, and 1 figure.

MYCOLOGIA

This periodical has appeared on alternate months during the year, making a volume of 349 pages, with 24 plates and

5 figures. Twenty-nine species of fungi were illustrated in their natural colors in this volume.

Bulletin

Bulletin no. 27, with 87 pages, was issued March 14, 1912. It contains the annual reports of the Director-in-Chief and other officers for the year 1911.

Bulletin no. 28, with 170 pages and 9 plates, was issued November 23, 1912. It contains "New Species from Bolivia, Collected by R. S. Williams—II," by H. H. Rusby; "The Polyporaceae of Mexico," by W. A. Murrill; "Additions to the Paleobotany of the Cretaceous Formation on Long Island. No. III," by Arthur Hollick.

Contributions

Contributions by members of the staff or students of the Garden, reprinted during the year from other than Garden publications, are as follows:

No. 147. "Studies of West Indian Plants—IV," by Nathaniel Lord Britton.

No. 148. "List of Plants Collected on the Peary Arctic Expedition of 1905–06 by Dr. L. J. Wolf, and of 1908–09 by Dr. J. W. Goodsell," by P. A. Rydberg.

No. 149. "Studies in Pyrophilous Fungi—III. The Viability of the Spores of *Pyronema*," by Fred. J. Seaver.

No. 150. "The Individuality of the Chromosomes and their Serial Arrangement in *Carex aquatilis*," by A. B. Stout.

No. 151. "Studies on the Rocky Mountain Flora—XXVI," by Per Axel Rydberg.

No. 152. "The Genus *Struthiopteris* and its Representatives in North America—I," by Jean Broadhurst.

No. 153. "Studies on the Rocky Mountain Flora—XXVII," by Per Axel Rydberg.

No. 154. "Biochemical Studies of Soils Subjected to Dry Heat," by Fred J. Seaver and Ernest D. Clark.

No. 155. "Polycodium," by C. B. Robinson.

North American Flora

Volume 7, part 3, containing descriptions of the Aecidiaceae (continuatio), by J. C. Arthur, was issued April 15, 1912.

Volume 17, part 2, containing descriptions of the Poaceae (pars), by G. V. Nash, was issued September 18, 1912.

Lectures

Public Lectures

Illustrated public lectures on botanical subjects have been given in the museum building on Saturday afternoons from April to the middle of December, as outlined below. The total attendance for the year has been 3,521, averaging 103 for each of the 34 lectures.

April 27. "Date Gardens of the Sahara Desert," by Mr. T. H. Kearney.

May 4. "The Preservation of Our Native Plants," by Dr. N. L. Britton.

May 11. "The Deserts and Mountains of Southern Arizona," by Professor H. M. Richards.

May 18. "Botanizing in the Region of the Natural Bridges, Utah," by Dr. P. A. Rydberg.

May 25. "Some of the Plants that Live in the Sea," by Dr. M. A. Howe.

June 1. "Condiments and Spices and Their Sources," by Dr. H. H. Rusby.

June 8. "Orchids," by Mr. G. V. Nash.

June 15. "Four Weeks in Western Cuba," by Dr. C. S. Gager.

June 22. "Poisonous Plants of Our Woodlands," by Mr. Norman Taylor.

June 29. "Exploring the Pacific Coast—I. New York to Seattle," by Dr. W. A. Murrill.

July 6. "The Botanical Exploration of Cuba," by Dr. N. L. Britton.

July 13. "Aquatic Flowering Plants," by Dr. John H. Barnhart.

July 20. "Fossil Plants and Their Significance," by Dr. Arthur Hollick.

July 27. "Some Floral Features of Southern Florida," by Dr. M. A. Howe.

Aug. 3. "Indian Agriculture," by Dr. A. B. Stout.

Aug. 10. "City Trees: Their Planting and Protection," by Mr. Carl Bannwart.

Aug. 17. "Exploring the Pacific Coast—II. Washington to Oregon," by Dr. W. A. Murrill.

Aug. 24. "Grasses and Some of Their Uses," by Mr. G. V. Nash.

Aug. 31. "Exploring the Pacific Coast—III. Oregon to California," by Dr. W. A. Murrill.

Sept. 7. "Plant Parasites and Some Means of Controlling Them," by Dr. F. J. Seaver.

Sept. 14. "Experiments in Mutation," by Professor Hugo de Vries.

Sept. 21. "Exploring the Pacific Coast—IV. California," by Dr. W. A. Murrill.

Sept. 28. "The Upper Delaware Valley and its Flora," by Mr. G. V. Nash.

Oct. 5. "Botanizing in the Yellowstone National Park," by Dr. P. A. Rydberg.

Oct. 12. "Insect Galls Injurious to Vegetation," by Dr. E. B. Southwick.

Oct. 19. "Some Microscopic Water Plants," by Dr. M. A. Howe.

Oct. 26. "The Chemical Production of Albuminous Matters in Plants," by Professor W. J. Gies.

Nov. 2. "Exploring the Pacific Coast—V. California to New York," by Dr. W. A. Murrill.

Nov. 9. "Horticulture in the Northwest," by Mr. G. V. Nash.

Nov. 16. "The Forests of the Amazon," by Dr. H. H. Rusby.

Nov. 23. "Recent Exploration in Bermuda," by Dr. N. L. Britton.

Nov. 30. "A Botanical Expedition to Cuba," by Dr. W. A. Murrill.

Dec. 7. "Some Floral and Scenic Features of Jamaica," by Dr. M. A. Howe.

Dec. 14. "The Vegetation of Southern Florida," by Mr. G. V. Nash.

School Lectures

The usual lectures and demonstrations were given in the autumn to the public school children of the 4B and 5B grades, of the Borough of the Bronx, under the auspices of the Board of Education, as follows:

Grade 4B

Lecture I, "Cultivation of Plants," by Mr. George V. Nash, was given to groups of pupils in the morning and afternoon of October 28.

Lecture II, "Seedless Plants," by Dr. Marshall A. Howe, in the morning of November 7.

Grade 5B

Lecture I, "Classification of Plants," by Dr. N. L. Britton, in the morning and afternoon of October 24.

Lecture II, "Woody Plants and Plants without Wood," by Dr. F. J. Seaver, in the morning and afternoon of October 30.

Lecture III, "Plant Products," by Dr. H. H. Rusby, in the morning and afternoon of November 4.

Scientific Meetings

The monthly Conferences of members of the staff and students have been continued, and a report of each meeting has been published in the current number of the Journal.

The Torrey Botanical Club has met each month as usual in the morphological laboratory of the museum building.

Members of the American Association of Museums, on the occasion of its seventh annual meeting, held in New York City, were the guests of the Garden on June 7.

The Horticultural Society of New York, in cooperation

with the New York Botanical Garden, held exhibitions of plants and flowers in the museum building on May 11 and 12, May 25 and 26, June 8 and 9, June 29 and 30, August 31 and September 1 and 2, and September 28 and 29. Accounts of these exhibitions were published in the JOURNAL for June and November.

Personal Investigations

The chief scientific work accomplished by me during the year was the preparation and publication of a series of articles on the gill-fungi and polypores of the Pacific coast, based largely upon my own collections made in that region in the autumn of 1911. Of the 170 species thus far treated in these articles, 77 are new to science.

Work has been continued on the higher fungous flora of tropical North America, two papers having been published on the gill-fungi and one on the polypores, making a total of 106 tropical species treated during the year, 49 of which proved to be new.

The fungi of the northeastern United States were studied, particularly those in the vicinity of Lake Placid in the Adirondacks, where a large collection was obtained during late summer and autumn, with many valuable notes from fresh specimens, which will be used in monographic work for NORTH AMERICAN FLORA.

Attention was devoted to the local fungi chiefly for the purpose of adding to the collection of colored drawings made by Miss Eaton for the swinging frames. Nearly two hundred of these are now completed, with the labels printed, and the work of mounting them in the museum is in progress.

The series of popular articles on fleshy fungi, accompanied by colored plates, which has been a feature of MYCOLOGIA since its inauguration, has been successfully continued during the year, about thirty species having been described and figured in their natural colors.

Respectfully submitted,

W. A. MURRILL,

Assistant Director.

REPORT OF THE HEAD GARDENER

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1912.

Systematic Plantations

HERBACEOUS GROUNDS. There are in the herbaceous collections, including those at the nurseries, about 3,050 species and varieties. The grounds now include 128 beds,—an addition of three. This increase was caused by the division of the old pink family into its four segregates,—the pink, chickweed, whitlow and knawel families, and by the addition of a bed for tulips, and another for the grass family. Of the beds formerly used for the pink family two were abolished,—two others being made elsewhere to replace them. Individual show labels, 344 in number, have been made for this tract.

FRUTICETUM. There are about 1,710 specimens here. Including those at the nurseries, the shrub collections represent about 800 species and varieties. There have been 1,015 show labels installed here during the year.

SALICETUM. About 40 species and varieties, including those at the nurseries, represent the willow family here. The number of specimens is 112.

DECIDUOUS ARBORETUM. About 295 species and varieties are represented in this collection, including those native to the tract and in the nurseries. Show labels made number 239.

PINETUM. The conifer collection, including those at the nurseries, represents about 285 species and varieties, embracing about 1,100 specimens. Show labels made number 584.

VITICETUM. There are about 50 species and varieties here.

CONSERVATORIES. The collections of tender plants, including those at the propagating houses, represent about 8,650 species and varieties, embracing 207 families and 1,480 genera. The total number of plants in the conservatories is 17,659.

Range No. 1. Show labels added, 1,425. The col-

lections here comprise 11,981 plants, distributed as follows: house no. 1, 275; no. 2, 434; no. 3, 618; no. 4, 512; no. 5, 1,524; no. 6, 746; no. 7, 1,018; no. 8, 569; no. 9, 148; no. 10, 1,006; no. 11, 367; no. 12, 1,225; no. 13, 555; no. 14, 749; no. 15, 2,080; cellar, 155.

Upon the completion of the additional houses at range no. 2 a portion of the orchid collection in house no. 15 was moved to the new houses.

Range No. 2. Show labels added, 111. The plants in the houses of this range number 5,678, distributed as follows: house no. 1, 78; no. 2, 137; no. 3, 57; no. 4, 1,045; no. 5, 1,950; no. 6, 1,192; no. 7, 1,203; cellar, 16.

As previously noted, late in the summer a part of the orchid collection from range no. 1 was moved here; also the orchids which had formerly been at the propagating houses. The bromeliads, also formerly at the propagating houses, now form a part of the collections of range no. 2. The north house of the two new ones is for East Indian orchids and others requiring a higher night temperature and greater humidity.

PROPAGATING HOUSES AND NURSERIES. These have been taxed to their utmost capacity during the past year by the great increase in the amount of work in plant breeding being carried on by the Director of the Laboratories. House no. 2 is entirely devoted to experiments along this line. The area in the nurseries enclosed by the wire fence was entirely given over to this work, and during the coming year additional space will be required to carry on this work. This great increase in the amount of work will require the services of another man during the summer. Houses nos. 5 and 6 have been given over entirely to the collection of desert plants, mostly cacti. In addition to the above a great amount of propagation is necessary to supply the plants required for the increasing decorative flower beds.

The plants in the propagating houses, excluding those under the immediate control of the Director of the Laboratories, number 11,435. Packets of seeds to the number of

1,397 have been received, as follows: by gift, 95; by exchange, 1,233; collected on expeditions, 53. In addition to the above, 700 packets have been added through our own collections.

Labeling, Recording and Herbarium. Accession numbers 35,002 to 37,036 have been recorded, making a total of 2,035 accessions. Show labels to the number of 4,758 have been made, as follows: deciduous arboretum, 239; herbaceous grounds, 344; economic garden, 14; morphological garden, 4; west border, 72; fruticetum, 1,015; pinetum, 584; roads and paths, 785; conservatory decorative beds, 29; decorative beds, elevated approach to conservatories, 85; elevated approach border, 26; conservatory, range no. 1, 1,425; conservatory pools, range no. 1, 18; conservatories, range no. 2, 111.

The following plants have been acquired: by gift, 754, valued at about $600; by exchange, 1,291; by purchase, including 2,276 bulbs, 3,419; collections made by members of the staff and others, 880; derived from seeds from various sources, 2,438; total, 8,782.

Additions to the collections of cultivated plants number 445 specimens. An approximate estimate of the number of plants in each collection is as follows: conservatories, 8,650; herbaceous, 3,050; fruticetum, 800; salicetum, 40; deciduous arboretum, 295; pinetum, 285; viticetum, 50; total, 13,170.

Miscellaneous Collections

Morphological Garden. An additional bed has been provided, containing plants illustrating mutation. Four show labels have been added.

Economic Garden. Fourteen show labels have been added. This is one of the most instructive of the collections, and attracts a large number of visitors.

Desert Plants. The increasing size of these collections, both in numbers and individuals, has made necessary the enlargement of the beds devoted to them in the court of conservatories, range no. 1. They are always a center of attraction for visitors to the conservatories.

Conservatory Lily Pools. The collection of tender water lilies in the westerly pool comprises many striking forms. The plants flowered early and continued in bloom late, owing to the open fall. Four plants of the Paraguay royal water lily were in the collection this year, bearing a number of flowers. Eighteen show labels were added.

Aquatic Garden. The planting near and around the aquatic garden is becoming more decorative each year. The various water lilies are well established and give a profusion of bloom throughout the summer. Eighteen show labels were added.

Rhododendron Banks. This is one of the most conspicuous features of the Garden. In addition to the Madonna lilies, which come into bloom in June, other lilies have been added, carrying the blooming period of these flowers through July, August and September. The other lilies are: *Lilium auratum*, *L. speciosum*, in several forms, and *L. tigrinum Fortunei giganteum*. The rhododendron plants are making a good growth, and during the summer have set a large number of buds which will develop during the coming summer. This applies especially to *R. catawbiense*.

Other Decorative Plantations. Here are included the following: beds in the immediate vicinity of conservatories, range no. 1, including one at the base of the west terrace, completed this fall with the exception of the shrub background; those at the elevated approach, west border, and along the paths from the elevated to the conservatories; and a group of lilacs, the gift of Mr. T. A. Havemeyer, installed in the bend of the path near the fountain enclosure. To these plantations 222 show labels have been added.

General Horticultural Operations

The following force has been available for this work: 2 foreman-gardeners, 19 gardeners, 2 apprentices,—one of the latter for only two months,—18 laborers, and 4 drivers during the open season. In the conservatories the immedi-

ate direction of the work has been under Richard Richter, foreman-gardener, who has had under him 14 gardeners, the 2 apprentices, and 1 laborer. The outside work has been carried on under foreman-gardener John Finley, his force consisting of 5 gardeners, 17 laborers, and 4 drivers.

In addition to the regular routine horticultural operations, the following new planting has been done. During the spring about 100 lilacs, secured by exchange with the Buffalo Botanic Garden, were placed at the foot of the retaining wall on the east side, continuing the lilac planting already there; a collection of about 60 plants, the gift of Mr. R. Boeder, of Williamsbridge, were transported and placed in various parts of the grounds, some of these being trees of considerable size, requiring care and time in handling; the area between the path and driveway in the pinetum, to the west of the conservatories, was planted with conifers, some obtained from the beds at the conservatories, others by purchase; the conifer planting at the west end of the long bridge was enlarged, continuing this on the other side of the path, 50 plants being used in this work, including a few necessary to replace certain ones which died during the winter.

The principal new planting of the fall was the beginning of the proposed extensive decorative planting at the foot of the terrace at conservatory range 1. This planting is to consist of a strip on both ends and the north side, similar in character to that already existing to the north of the conservatories, that is, a background of mixed evergreens and deciduous shrubs, with a herbaceous border in front. The areas at the east and west ends of the terrace were prepared, that at the east end for a rose garden, to be installed the coming spring, while the west end was planted with a collection of herbaceous plants, including many peonies and bulbs, the background of evergreens and shrubs to be placed later. Another important piece of new work was the planting of a collection of 41 kinds of lilacs, two plants of each, at the bend in the path, near the fountain at the foot of the museum approach. This valuable addition to the decorative

collections of the Garden is the gift of Mr. T. A. Havemeyer, who included in the gift an additional collection of 134 miscellaneous shrubs. Other planting accomplished during the fall is as follows: a privet hedge on the east side of the manure yard at the nursery; a privet hedge at power-house no. 2; privet hedges on both sides of the service driveway at conservatory range no. 1; a shrub screen around the scales at power-house no. 1; a group of cornel at the southeast corner of the North Bridge; two more trees of *Oxydendrum arboreum* in the rhododendron triangle; twelve ashes transplanted from the grounds to the west border; forty *Crataegus* to the west border; a group of *Symphoricarpos* added to the decorative planting at Newell Ave.; three Lombardy poplars along the walk in the north meadow. In various parts of the grounds imperfect or dead specimens have been replaced with others.

Investigations and Lectures

In addition to routine duties I have continued my studies upon the grasses for NORTH AMERICAN FLORA. The part to which reference was made in my report of last year was issued late last summer. I have also begun studies upon the orchids for the same work.

I have given five lectures in the regular courses of public lectures at the Garden, and two lectures to grade 4B of the public schools of the Bronx in their course on nature study.

Respectfully submitted,

GEORGE V. NASH,

Head Gardener.

REPORT OF THE HEAD CURATOR OF THE MUSEUMS AND HERBARIUM

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1912.

The collections included in the museums and herbaria were increased by specimens from many parts of the New World and the Old. The more important specimens for

both the public exhibits and the study collections came from America and were obtained chiefly through exploration and exchanges.

The collections under my care were increased as follows:

By gift and purchase..... ..... 9,630 specimens.
By exploration.....14,558 specimens.
By exchange. .... 7,009 specimens.

Thus a total of 31,197 specimens was brought together. Detailed lists of accessions have been published in the monthly issues of the JOURNAL during the year.

The value of the gifts is estimated at $1,137.

Not less than 9,547 duplicate specimens were sent to other institutions and to individuals as exchanges.

Museums

The museum equipment remained practically the same as in the previous year. The additional exhibition cases planned for early in the year were not completed until the last week in December and consequently they were not available for the installation of specimens.

The most important single addition to the museum exhibits was a collection of twelve old Chinese paintings, given by Dr. Reginald H. Sayre, showing the methods of cultivation, preparation, and packing of tea as practiced in China about two centuries ago. This collection is now displayed in four panel wall-cases on the landing of the stairway leading from the main floor of the Museum Building to the second floor.

A large amount of exhibition material has been placed in storage, awaiting both space and mechanical means of displaying it.

FOSSIL PLANT MUSEUM. The specimens in the several wall cases of this museum were rearranged preparatory to providing them with new printed labels. Desirable specimens were added to the series displayed in the floor cases, and specimens recently received were placed in their proper places in the cases of the study collections.

Economic Museum. The development planned for this part of the public museums was frustrated by the delay in the finishing of the exhibition cases referred to above. However, most of the subdivisions of this museum were increased by the addition of individual specimens. Some rearrangements of exhibits were made, and the large collection of resins was partly developed.

For further notes on this museum see the report of the Honorary Curator of the Economic Collections.

Systematic Museum. No special development for either of the four elements comprising this museum was contemplated during the year, except the fleshy fungus series of the Local Flora Exhibit.

The Synoptic Collection was improved by the addition of special specimens collected or acquired through exploration by members of the Garden staff, and by miscellaneous specimens.

The Local Flora Exhibit. A few specimens were added to this series and some specimens which had deteriorated were replaced by fresh ones. The series of paintings illustrating the fleshy fungi of the local flora region was completed during the fall. It will be installed early next year. It had been planned to install this collection in the swinging frames before the end of this year, but the inability to secure proper cardboard mounts defeated the accomplishment of the plan.

The Microscope Exhibit. The public interest in this exhibit was maintained as heretofore. Two microscopes were temporarily removed from the series on account of the thefts of small parts of the instruments. These should be replaced early next year, thus making the exhibit complete and intact.

The Plant Photograph Exhibit described in my last annual report was maintained essentially as it was originally installed last year. It attracted considerable attention from the visiting public. A similar series would be equally effective on the walls of the Economic Museum.

Herbaria

The herbarium equipment was not essentially changed during the year. As previously stated in regard to the museums, the herbarium cases, which were to be available earlier in the year, were not finished until the end of December.

The collections comprising the herbaria were increased by specimens derived from a very extensive geographic area, particularly by the addition of algae, fungi, hepaticae and mosses, and flowering plants, from North America. Two valuable private herbaria came into the possession of the Garden, one, that of the late Mr. J. J. Crooke, as your gift, the other that of the late Professor A. J. McClatchie. All desirable current plant distributions and exsiccatae were secured.

About 48,000 specimens, representing selections from collections in storage and from the herbaria referred to in the preceding paragraph, as well as the specimens of the distributions and exsiccatae also referred to above, were mounted on about 32,000 herbarium sheets and were incorporated in the permanent collections. Several thousand bulky specimens of fungi, fruits, and seeds were added to the series contained in multiple size boxes.

The uneven development of the general herbarium necessitated the shifting of nearly the whole collection once, and parts of it several times, during the year.

The monographic work in connection with North American Flora resulted in materially building up the herbarium, especially in the case of those groups of plants upon which the current work is directed. Many fragmentary type specimens and photographs of type herbarium sheets were acquired as a result of the work on this flora.

An important and desirable feature of the year's work was the mounting, and incorporating in the permanent collection, of several years' accumulation, representing many thousands of Philippine Island plants of recent collections.

The fruit and seed collection, a part of the herbarium,

which is contained in cardboard boxes of multiple sizes and in glass jars, was renovated and completely rearranged.

Several hundred specimens given to Columbia University and deposited with the Garden, together with some specimens from the Morong herbarium, were mounted and incorporated in their proper places.

Investigations and Assistance

Dr. P. A. Rydberg, Curator, had charge of the herbarium of flowering plants. His time, when not occupied by mechanical curatorial work, was devoted to the conclusion of a monograph of the family Rosaceae, the earlier parts of which have already been printed in NORTH AMERICAN FLORA, and to the continuation of his study of the flora of the Rocky Mountain region. In this connection he prepared four papers on the plants of that region, two of which were printed during this year, and continued the study of the specimens collected in southeastern Utah last year. Dr. Rydberg spent a month during the latter part of the year at the United States National Museum, studying the Rocky Mountain collections contained in the National Herbarium, and delivered two lectures in the Garden lecture courses.

Dr. Marshall A. Howe, Curator, continued to have charge of the collections of algae and hepaticae. The work of incorporating the Mitten and the Underwood collections of hepaticae with the general hepatic collections owned by the Garden was discontinued early in the year on account of the lack of assistance, but this work, it is expected, will be resumed with the beginning of the new year. Dr. Howe represented the Garden at the exercises commemorative of the one hundredth anniversary of the founding of the Academy of Natural Sciences of Philadelphia, held in Philadelphia March 19–21, and presented on that occasion an illustrated paper on "Reef-building and Land-forming Seaweeds." This paper, in a more amplified form, was published in *Science* for May 31, under the title "The

Building of 'Coral' Reefs." Dr. Howe's researches during the year have been concerned chiefly with a large collection of marine algae from Peru, the results of which are now nearly ready for publication. He has continued to act as an associate editor of the publications of the Torrey Botanical Club, and has delivered four lectures in the Garden lecture courses.

Dr. Fred J. Seaver, Curator, continued as editor of the JOURNAL of the Garden and also as associate editor of MYCOLOGIA. Much time was spent in the naming of fungi and in the preparation and mounting of this material. A limited amount of time was spent collecting fungi of the local flora region. This work resulted in the discovery of several undescribed discomycetes and the addition of many valuable specimens to our collections. Critical preliminary studies have been continued on certain groups of ascomycetes for monographs for NORTH AMERICAN FLORA. During the summer months considerable time was devoted to the study of insect parasites in the Garden and on the means of controlling them. One lecture dealing with this subject was given in the regular Garden lecture courses and also before the New York Horticultural Society. Dr. Seaver recently accompanied you to Bermuda for the collection and study of the fungi of that island. He also published several papers on different groups of fungi.

Dr. Arthur Hollick, Curator, was granted leave of absence for the first quarter and the last quarter of the year in order that he might continue the study of the collections of fossil plants made by him in Alaska several years ago under the auspices of the United States Geological Survey. From the 1st of April to the 31st of October Dr. Hollick cared for the collections of fossil plants, and in this connection he had the continued voluntary assistance of Mr. Edwin W. Humphreys. Dr. Hollick continued his studies on the fossil plants of the vicinity of New York City and prepared the manuscript and drawings of several papers, one of which, "Additions to the Paleobotany of the Cretaceous Forma-

tion on Long Island, No. III," was issued in November. He also delivered a lecture in the Garden lecture course, and edited No. 28 of the Garden BULLETIN.

Mr. Percy Wilson, Assistant Curator, devoted considerable time to the study and distribution of West Indian plants received from various institutions for determination, and also to large collections brought in by exploring expeditions sent out by the Garden. He had charge of all public lectures, the photographic work, the lantern slide collection, and the Garden publications on sale, and was occupied with docentry duties four or five afternoons each week.

Dr. C. B. Robinson, Assistant Curator from January to September, devoted his attention to the study of large collections of Philippine plants and to the incorporation of the specimens in the herbarium, and prepared a monograph of a large part of the family Vacciniaceae for a contemplated part of NORTH AMERICAN FLORA. He resigned in September in order to accept a position in the Bureau of Science, at Manila, Philippine Islands.

Mrs. N. L. Britton, Voluntary Assistant for the first third of the year and Honorary Curator of Mosses for the remainder of the year, continued to devote her time and energy to the development of the moss collections. From the inception of the Garden Mrs. Britton devoted most of her time and much energy to increasing and arranging the moss herbarium. In recognition of these valuable services, the Board of Managers, on May 23, appointed Mrs. Britton "Honorary Curator of Mosses." During this year she accomplished the mounting and distribution of the current accessions, the large collections of the Mitten herbarium purchased several years ago, and distributed many duplicates to both home and foreign institutions and monographers, and by special effort succeeded in making our representations of large and intricate genera, such as *Sphagnum*, *Dicranum*, *Fissidens*, *Bryum*, and *Polytrichum*, especially those groups needed for monographic work on NORTH AMERICAN FLORA, essentially complete. Mrs. Britton,

with the cooperation of Mr. R. S. Williams, administrative assistant, and other collaborators, finished and sent to press the first part of the volume of NORTH AMERICAN FLORA devoted to mosses, and accomplished much preliminary work on the two parts which are scheduled to succeed it. Mrs. Britton prepared a series of articles on "Wild Plants Needing Protection," which appeared, with the addition of colored plates, in several issues of the JOURNAL of the Garden, and continued her studies on West Indian mosses, partly with the cooperation of Dr. A. Leroy Andrews, who compared specimens with and made notes on type specimens in herbaria of northern Europe as an aid to a more accurate determination of the West Indian collections, which are constantly being increased by further additions from Cuba, Jamaica, Porto Rico, and other islands.

In addition to my curatorial detail and routine I continued monographic work in connection with NORTH AMERICAN FLORA, particularly on the family Ericaceae. I also devoted some time to a continuation of my studies on the flora of the southeastern United States, particularly to the floras of Texas and Florida, and completed my studies on the plants collected by me in tropical Florida in 1911. I spent about five weeks, in November and December, exploring and collecting on the Miami limestone region of tropical Florida, and on the Florida Keys at points from the Upper Sand Keys to Key West.

Respectfully submitted,

J. K. SMALL,

Head Curator of the Museums and Herbarium.

REPORT OF THE HONORARY CURATOR OF THE ECONOMIC COLLECTIONS

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1912.

Although considerable has been accomplished during the past year in the development of the Economic Museum, we

have not been able to fully present the results to the public, as anticipated, because of some delay in the installation of our new cases.

The accessions of the year number 314 specimens, mostly of a miscellaneous character. A large part of these consist of foods and drugs, mostly from the New York market, many of them somewhat rare. A number of the accessions have been secured through the explorations of the members of our own staff.

The most important group of accessions is a series of Chinese paintings, representing the tea industry in China, presented by Dr. Reginald H. Sayre.

Others worthy of special note are the following: a set of specimens representing the Florida arrow-root industry; a number of Chinese edible seeds; a specimen of *Fatsia* pith, used by the Chinese in the manufacture of a fine paper; a trunk of the Hevea rubber tree, from Ceylon, indicating the method of collecting the rubber milk; the edible fruit of *Strychnos spinosa* Lamarck; the edible tubers of *Opuntia austrina* Small, from Florida.

Owing to the crowded condition of our cases, it has been found necessary to temporarily store the greater part of the year's collections. Our new cases will probably be ready for use early in 1913, when a complete rearrangement of the collections in the western portion of the Museum will be made.

It is to be remembered that, in addition to these museum collections, we are gradually accumulating in the conservatories a large representation of living useful plants. An important addition to these collections during 1912 has been a fine case of Hevea rubber plants. Now that we have a conservatory space available for such plants, their number may be expected to increase rapidly.

Respectfully submitted,

H. H. Rusby,

Honorary Curator of the Economic Collections.

REPORT OF THE DIRECTOR OF THE LABORATORIES

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1912.

The Laboratories

Some minor changes have been made in the laboratories during the past year. Two working desks have been added, making at present eight desks for student use. A specially constructed seed cabinet has been placed in the laboratory to provide for the proper storing of the seed used in the investigations in genetics. It is planned to provide early in the coming year several high power objectives for the microscopes now in stock, thereby meeting the needs of the immediate future in this respect.

Meteorological Records

Records of the amount of precipitation and of the air and soil temperatures have been taken throughout the year, and monthly summaries of these have been furnished for publication in the Garden JOURNAL.

Conference Meetings

A monthly conference of the scientific staff and registered students of the Garden has been held, except during the summer months. As secretary of this conference I have planned the programs, sent notices of each conference to members of the botanical staff at Columbia University and Barnard College, and of the Brooklyn Botanic Garden, and prepared abstracts of the topics presented for publication in the Garden JOURNAL.

Personal Investigations

The general plan for my personal investigations as outlined in my report one year ago, has been quite closely followed. During the winter months certain phases of the cytological studies of *Carex aquatilis* were completed and prepared for publication. There remains, however,

the study of fertilization in this species, for which I have material at hand. Considerable material was obtained during the spring from other species of *Carex* for more extended cytological studies in this genus.

Regarding my study of the fungus *Sclerotium rhizodes*, I can report that this fungus has been found to be very abundant in the upper Hackensack meadows, where it is very destructive to *Calamagrostis canadensis*. The presence of the fungus in this vicinity gives opportunity for continued search in the field for the perfect stage of this fungus which, at the present time, is not known.

During the summer months my time was almost entirely devoted to experimental studies in plant breeding. Thus far I have worked with the following groups of plants: (1) *Cichorium Intybus*, wild white-flowered plants, wild blue-flowered plants, and plants grown from seed of cultivated strains; (2) *Verbascum Blattaria*, yellow-flowered and white-flowered plants; (3) *Hibiscus militaris*, *H. Moscheutos*, *H. oculiroseus*, and the hybrid *H. oculiroseus* × *H. Moscheutos*, and (4) *Carex stricta* and *Carex Goodnovii*.

The work of the past summer on these forms was in large measure preliminary and consisted chiefly in studying the vegetative characters, and in securing pedigreed seed from controlled self-fertilizations and cross fertilizations. The results obtained encourage continued experimentation with all these forms.

In connection with the studies of *Hibiscus* several days were spent in southern New Jersey at Island Heights, where observations were made over large fields of wild *Hibiscus Moscheutos*, with special regard to the variability of this species. Several plants representing ranges in the variability were shipped to the Garden and planted in the experimental garden for use in the breeding experiments. I hope to be able to make more extended observations of this sort in the field during the coming summer.

Systematic observations have been made during the year on the phenomena of bud variation in *Coleus Blumei*.

Several generations of plants have been grown from cuttings and many data obtained regarding the variation exhibited by these plants. In some cases the conditions suggest a chimera relationship of different tissues. The results warrant a more intensive study of these forms with an investigation of the results of sexual reproduction.

Some progress can be reported in the assembling and observation of plant chimeras. Two Bizzaria plants have been obtained from Florence, Italy, and it is planned to secure specimens of *Cytisus Adami* and the various *Crataego-mespilus* chimeras. The interesting case of reversal of tissue relations has appeared in a plant of *Pelargonium zonale*. For the experimental production of chimeras preliminary grafts have been made between various forms of *Eranthemum*, which seems favorable for this kind of investigation.

It is my plan to supplement the experimental studies with such cytological studies as are desirable. To this end material has been fixed and imbedded for a study of the typical and the atypical nuclear divisions and of fertilization in *Cichorium Intybus*. It has also seemed highly desirable that the wealth of material afforded by the large collection of Cacti assembled in the greenhouses be utilized for various cytological research. Considerable material collected from a number of species has been properly prepared for future study and some microscopic preparations have been made from the material.

The Experimental Garden and Greenhouse

An area of ground adjacent to the propagating houses was utilized at your direction as an experimental garden. Here were grown various plants used in the experimental work. *Coleus Blumei*, *Cichorium Intybus*, *Verbascum Blattaria* and *Hibiscus* (various species) were grown for my personal study. Several forms of *Mirabilis* and a number of cereals were grown for student research, and several varieties of corn were grown for study by Professor R. A. Harper. Various

plants that are of particular interest to botanists were grown. Among these were several forms of *Onagra*.

To realize the definite plans of another year more ground is needed, and I am pleased to report that according to your direction preparations have been made to almost double the area of the experimental garden.

A greenhouse is being devoted to the needs of the experimental work. The seedlings of various species of *Chicorium*, *Hibiscus*, *Althaea*, *Verbascum*, etc. are grown here during the winter and spring months, making such development before they are transplanted that they blossom in the field the first season. Various plants utilized for student research during the winter are, as far as possible, grown in this house.

Students and Investigators

The list of students here given is composed mainly of the following classes: (1) investigators holding scholarships at the Garden; (2) research students in botany registered at Columbia University but working in part at the New York Botanical Garden; (3) students registered only at the Garden and pursuing their studies under the direction of various members of the Garden staff.

A considerable number of these students have come more or less under my supervision. In considering the various problems of student research, I have had the helpful and hearty cooperation of Dr. R. A. Harper, Professor of Botany at Columbia University, who is present at the Garden a part of each week, and of Professor William J. Gies, head of the Biochemical Department of Columbia University, who has during the present academic year been at the laboratories one afternoon each week for consultation.

Two theses for the degree of A.M. were completed by students of the laboratory during the past year: one by Mr. Bristol on "The Starches of Drug Plants," and one by Miss Topp on "Variegation in *Miscanthus*." The student research in plant genetics with which I am especially interested pertains chiefly to the following plants; several varieties of

Hordeum, *Triticum*, *Secale*, *Althea*, *Ligustrum*, *Abutilon*, *Weigela*, *Mirabilis*, *Phlox* and *Lupinus*.

In the following list the more complete biographical data are given for *new students only*. For those students who have been registered in previous years there is here stated only the degree, the position held or last held and the problems which they are investigating.

*Altenberg, Edgar. A.M., Columbia Univ., 11. Assistant in Botany, Columbia Univ.

Heredity of Althaea rosea and of various cereals.

Ames, Adeline. A.M., Univ. of Neb., 04; Assistant, Bureau of Plant Industry, 04–09; Phi Beta Kappa, Univ. of Neb., 03; Sigma Xi, Cornell Univ., 11; Research Student, Cornell Univ., 09–.

Mycology.

†Benedict, Ralph Curtiss. Ph.D., Columbia Univ., 11. Teacher of Botany, High School of Commerce, N. Y. City.

Comparative morphology and classification of ferns.

Bristol, Warren Edwin. A.M., Columbia Univ., 11. Educational Director, East Side Y. M. C. A., N. Y. City.

Starches of drug plants; taxonomy of flowering plants.

Broadhurst, Jean. A.M., Columbia Univ., 08. Postgraduate, Cornell Univ., 11–.

Taxonomy of ferns.

†Clark, Ernest Dunbar. Ph.D., Columbia Univ., 10. Instructor in Chemistry, Cornell Univ. Medical School.

Problems in plant chemistry.

Eggleston, Willard Webster. B.A., Dartmouth, 91. Bureau of Plant Industry 10–.

Taxonomy of Pomaceae and Prunaceae.

*†Fromme, Fred D. B.S., South Dak. State College, 11. Assistant in Botany, Columbia Univ., 10–.

Mycology; parasitic fungi.

*Kelly, James P. B.S., City College, N. Y., 06. Woods Hole Laboratories 08 and 11; Jones scholarship, Station for Experimental Evolution, Carnegie Inst., Cold Spring Harbor, 12; Postgraduate at Columbia Univ., 09–.

Genetics.

* Registered at Columbia.

† Research scholarship.

KUPFER, ELSIE MABEL. Ph.D., Columbia Univ., 07. Head, Department of Biology, Wadleigh H. S.
Studies in variegation.

†MAXON, WILLIAM R. Ph.B., Syracuse Univ., 98. Assistant Curator, U. S. Nat. Museum.
Taxonomy of ferns.

†OVERHOLTS, LEE ORAS. A.B., Miami Univ., 12: Assistant in Botany, Miami Univ., 11–12; Scholarship, Washington Univ., St. Louis, 12–.
Polyporaceae of Ohio.

*PICARD, MAURICE. A.B., 10, A.M., 11, Columbia Univ. Phi Beta Kappa, Columbia Univ., 10; Wm. Mitchell Fellow, Columbia Univ., 10–11; Golden Smith Fellow in Botany, Cornell Univ., 11–12.
Cytology of Hibiscus.

*REID, KATHERINE WILLESS. A.B., Vassar, 12.
Heredity and variegation in Ligustrum, Abutilon and Weigela.

ROBINSON, WINIFRED JOSEPHINE. Ph.D., Columbia Univ., 12. Instructor in Botany, Vassar College.
Taxonomy of ferns.

SUMSTINE, DAVID ROSS, Sc.D. (honorary), Pennsylvania College, 10. Principal East High Division, Pittsburg, Penn.
Mycology.

*TANG, YOUNG-LEE. Student; Columbia Univ., 11–.
Plant breeding.

*†TOPP, EMILY PHILIPPINA. M.A., Columbia Univ., 11.
Variegation in Miscanthus.

*†WILSON, GUY WEST. M.S., Purdue Univ., 06. In charge of Extension Work in Botany, Columbia Univ., 12–.
Biologic species in Phytophora. Effect of heated soils on plant growth.

There are besides the above many persons whose studies in the herbaria, library, laboratories or grounds have not been sufficiently extended to warrant enrollment as students.

Respectfully submitted,

A. B. STOUT,
Director of the Laboratories.

* Registered at Columbia.
† Research scholarship.

REPORT OF THE LIBRARIAN

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1912.

When the Garden was established, it received as a deposit under a formal agreement nearly all of the books relating to botany in the library of Columbia University, and these still form a noteworthy percentage of the Garden library, and include many of the most necessary works of reference. In recent years, however, the department of botany of the University has felt an increasing need for some of these books, in its endeavor to build up a more useful departmental library, and early in the present year 540 volumes, requested by the University, were returned to it for this purpose. Of the books thus withdrawn the Garden had its own copies of 90 volumes; the private library of the writer, which is deposited with the Garden and available for reference, contained 35 more; since the transfer 187 have been purchased by the Garden, and 3 presented to it. This leaves 225 volumes not yet replaced; some have been ordered, but have not yet been received; some, while not exactly duplicated in the Garden library, are essentially so; of the remainder, few are of great importance.

Near the end of the year the remarkable and valuable collection of Darwiniana, formed by the late Charles Finney Cox, was purchased by special subscription and presented to the Garden in memory of Mr. Cox, who was so closely associated with the development of the institution. This gift included 125 bound volumes, many of them rare and in fine bindings. For a fuller account of the Cox collection of Darwiniana, one may refer to the JOURNAL for January, 1913.

During the year 779 volumes have been bound, including 39 which are the property of Columbia University. These 779 volumes, together with the Cox Darwiniana and the usual purchases and gifts, have more than offset the loss in number due to the large withdrawal by Columbia University,

so that the census taken at the end of the year shows 24,024 bound volumes, a net increase of 446 from the census of a year ago. About 1,500 written cards have been added to the catalogue during the year, and the principal accessions have been printed in the JOURNAL as usual.

In January five stacks were installed in the room west of the reading-room, providing about 650 lineal feet of additional shelving. This extension of the library equipment was urgently needed, but should be sufficient to provide for normal growth for several years.

The librarian has continued his work upon Lentibulariaceae as opportunity arose, contributing the text of this family of plants to several works now in press.

A list of the publications received currently by the Garden was appended to my report for 1910 (BULLETIN 7: 325–347); certain changes in the list were included in my report for 1911 (BULLETIN 8: 45); further required alterations in the list are as follows:

Change † to * before the following:

*Annals of Botany.
*Botanischer Jahresbericht.
*Botanisches Centralblatt.
*Flora.
*Jahrbücher für Wissenschaftliche Botanik.

Omit the following:

Broteria.
Country Life in America.
House and Garden.

Add the following:

Biochemical Bulletin, New York, N. Y.
Boletim de Bosques, Pesca i Caza, Santiago de Chile.
California. University of California, Berkeley, Calif. *Publications in Agricultural Science.*
*L'Amateur de Champignons, Paris, France.
*Landscape Architecture, New York, N. Y.

Respectfully submitted,

JOHN HENDLEY BARNHART,

Librarian.

REPORT OF THE SUPERINTENDENT OF BUILDINGS AND GROUNDS

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1912.

Regulating and Grading

This work has been done in various parts of the Garden. In the willows, on the eastern side of the main drive opposite Woodlawn Road approach, approximately 100 feet square was filled in to a depth of about two feet and was graded and sown with grass seed. On the western side of the Bronx River, from the Long Bridge north, a strip 500 feet long and 25 feet wide was filled in about eighteen inches and graded ready for top dressing. On the east side of the river road opposite Power House No. 2 a strip 20 feet wide and 210 feet long was graded and sown. The bank north of Power House No. 2, on the eastern side of the path, was graded 15 feet wide for a distance of 350 feet, which was then sown with grass seed and one catch-basin constructed.

On the eastern side of Bronx River, south of Boulder Bridge, a strip 75 × 200 feet was filled in eighteen inches deep and made ready for top dressing. About 240 yards of fill was used in this, which had been taken from a cut leading into the cellar of Conservatory Range No. 2. The bank on the eastern side of the road to Conservatory Range No. 2 from Long Bridge Road was graded, and an area of about 6,680 square feet was covered with sod. Both sides of the entrance to Power House No. 2 were graded and about 2,610 square feet covered with sod. One catch-basin was then built.

About 15,000 cubic yards of soil have been carted into the Garden by contractors doing work outside, who were looking for a convenient dumping place. This soil was used to fill in the northern side of Woodlawn Road Approach and was delivered and graded to our satisfaction, at the contractors' expense. We removed 2,782 loads of stone, 2,152 loads of top soil and 419 loads of earth. This stone was used to build paths. On the east side of the new road and propa-

gating house path an area of 108 × 155 feet was graded and sown with grass seed. Boulders, extending for a distance of 150 feet, were placed along the river road to guard the bank.

Drainage

In this class of work there has been laid 320 feet of six-inch pipe connected with the propagating houses on the east side running south, and through the boundary fence wall, with one catch-basin. One catch-basin was built at Power House No. 2, one at Long Bridge and one in the gutter north of Power House No. 2, at the cross walk. The four dams in the Herbaceous Grounds were repaired.

Roads and Paths

About 1,926 feet of new paths were completed. Around Conservatory Range No. 1 two 10-foot paths, each 330 feet long, with two cross paths each 45 feet long, one on the eastern side of the conservatories and the other on the western side, were constructed. A path 10 feet wide and 544 feet long was constructed from Conservatory Range No. 1 through the Pinetum to the Museum Building.

On the eastern side of the propagating houses a road 10 feet wide and 150 feet long, and one path at Power House No. 2, 10 feet wide and 200 feet long, were built. Two 10-foot cross paths, 38 feet and 29 feet long respectively, have been built at the northeastern part of the Garden, and 215 feet of connecting path at the Syphon.

On the eastern side of the Bronx River 1,186 feet of pathway and on the western side, north of Long Bridge, 450 feet were surfaced and screened. A path north of Power House No. 2, 350 feet long, one on the western side of the new road, 591 feet long, and another east of the river and north of Chestnut Bridge, 1,110 feet long, have been surfaced and screened.

The paths around Conservatory Range No. 1, the Museum building, and the Herbaceous Grounds were resurfaced with screening.

Guard Rails

An addition of 8,000 feet of one-inch guard rail, two rails high, was erected along the trails and paths in the hemlock grove. Along the river wall 500 feet of one-inch rail, three rails high, was erected, and 1,500 feet of single one-inch rail along the west path north of Mosholu approach.

Buildings

In addition to repairs in and around the buildings the carpenters have constructed twenty-five rustic benches, two lantern-slide cases, four herbarium cases, one seed case, four bill-head cabinets and four shadow-boxes for panel pictures. The second floor, west of the rotunda, and the lavatories on the top floor of the Museum Building have been painted; also houses nos. 5 and 12 of Conservatory Range No. 1, including all doors and tubs; the potting shed, walls and woodwork at the Propagating Houses; the tubs at Conservatory Range No. 2; and the interior of the women's lavatory near the elevated railroad approach. All of the guard rail in the hemlock grove received two coats of paint.

The bottom of the tanks in front of the Museum and the aquatic house were raised two feet and reconcreted, and are now in first-class condition.

One horse was purchased. The expenditures for one gasoline engine and pump, lawn mowers, horse plow, one horse, feeding and shoeing of horses, repairs to wagons, harnesses and machinery, were $2,023.75.

Grounds

Until the month of August we had but one city police officer to protect our grounds; but since then we have had three on Saturdays, Sundays and holidays, and one during week days. We have two keepers, with ten additional guards on Saturdays and holidays. The number of Sunday visitors during the warm months averaged about 25,000, with the exception of the month of July, when that number was greatly increased. Owing to the vigilance of our employees there has been but little damage done to the plantations this season.

Considerable repairs were made to the arbor by the carpenters during the year. A drinking fountain was placed in the northern end of the Garden.

In order to replace cracked flags in the steam trench under the north path at Bedford Park Boulevard entrance it was necessary to make an excavation eight feet wide, fourteen feet deep and twenty-five feet long. We also replaced four flags in the lawn in front of the Museum Building.

To facilitate spraying of the tallest plants two or more times a week a small gasoline engine with pump attached was purchased, for Conservatory Range No. 1, which proved satisfactory. By running the gasoline engine for two weeks five months supply of wood for fuel for the propagating houses was cut.

Respectfully submitted,

ARTHUR J. CORBETT,

Superintendent of Buildings and Grounds.

SCHEDULE OF EXPENDITURES DURING THE YEAR 1912

1. City Maintenance Account

Salaries, Regular Employees

Appropriated	$ 69,890.00
Expended	69,890.00

Wages, Temporary Employees

Appropriated	2,000.00
Expended	2,000.00

Supplies and Materials

Appropriated	$ 3,500.00	
Transferred from Fuel	600.00	4,100.00
Expended		4,100.00

Repairs and Replacements by Contract or Open Order

Appropriated	1,000.00
Expended	1,000.00

Housing, Storage and Repairs of Apparatus, Machines, Harness and Vehicles, except Automobiles

Appropriated	150.00
Expended	150.00

Shoeing and Boarding Horses, including Veterinary Service

Appropriated	225.00
Expended	171.50
Balance	53.50

Fuel

Appropriated	12,000.00	
Less—Transferred to Supplies and Materials	600.00	11,400.00
Expended—Contracts	9,474.00	
Open Market Orders	1,487.36	10,961.36
Balance		438.64

Forage

Appropriated	1,000.00
Expended	1,000.00

Telephone Service

Appropriated	100.00
Expended	92.84
Balance	7.16

Contingencies

Appropriated	400.00
Expended	400.00

Purchase and Original Equipment of Apparatus, Machines, Harness and Vehicles, except Automobiles

Appropriated	300.00
Expended	300.00

Summary, City Maintenance Account

Appropriated	90,565.00
Expended	90,072.46
Balance	492.54

2. Construction and Equipment

Accounts from 1897 to 1909

Appropriated		1,315,000.00
Premiums		27,974.53
		1,342,974.53
Expended—Contracts, Engineer's Pay Rolls, Architects' Fees, and Open Market Orders (Paid through the Park Department)	1,108,348.20	
(Paid by the New York Botanical Garden)		
Labor	$175,713.25	
Sundry bills	58,911.45	
	234,624.70	
Total Expended		1,342,972.90
Balance, rescinded January 6, 1912		1.63

Accounts for 1910

Balances, January 1, 1912		
Construction and Completion of Path System		9.57
Rock Excavating for Paths		10.87
Earth Excavating for Paths		8.03
Pipe for Connecting Drains		1.71
Improving Banks along Driveways and Paths		7.15
Purchase and Erection of Railings along Paths		7.12
Total		44.45
Rescinded, January 6, 1912		44.45

Erection of Greenhouses and Connecting Passages

Balance, January 1, 1912		225.66
Expended—Open Market Order		225.00
Balance		.66

Accounts for 1911

Construction of a Boundary Fence

Balance, January 1, 1912		20,000.00
Expended—Contracts	19,532.10	
Engineer's Pay Rolls	359.38	19,891.48
Balance		108.52

Construction of New Walks and Railings along Walks

Balance, January 1, 1912	1,855.59	
Deducted from Contract	93.63	1,949.22
Expended—Labor	1,906.75	
Open Market Order	42.00	1,948.75
Balance		.47

Rock and Earth Excavation within Grounds

Balance, January 1, 1912		2,979.25
Expended—Salaries and Labor		2,979.25

Construction of Masonry retaining Walls at Boulevard Entrance and Masonry Steps at Power House

Balance, January 1, 1912		1,300.00
Expended—Contracts	1,037.40	
Engineer's Pay Rolls	244.77	1,282.17
Balance		17.83

Erection of a Pergola

Balance, January 1, 1912		2,500.00
Expended—Contracts	1,724.10	
Engineer's Pay Rolls	466.05	2,190.15
Balance		309.85

New Cases for Museum Building

Balance, January 1, 1912		2,100.00
Expended—Contracts	1,168.00	
Open Market Orders	381.59	
Salary of Carpenter	325.00	1,874.59
Balance		225.41

Erection of an Additional Greenhouse

Balance, January 1, 1912		12,500.00
Expended—Contracts	11,042.85	
Engineer's Pay Rolls	329.04	
Open Market Orders	508.00	11,879.89
Balance		620.11

Summary 1911 Account

Appropriated		49,800.00
Expended—1911	6,471.53	
1912	42,046.28	48,517.81
Balance		1,282.19

3. Special Garden Accounts

Exploration Fund

1901 to 1911

Subscriptions	33,178.45	
Refunds	1,551.61	
Sales	100.00	34,830.06
Subscribed 1912		3,850.00
		38,680.06
Expended—1901 to 1911	34,829.81	
1912	3,843.65	38,673.46
Balance		6.60

Museum and Herbarium Fund

1901 to 1911

Subscriptions	10,485.00	
Refunds	131.09	
Sales	254.50	10,870.59
Subscribed 1912	1,400.00	
Refunds	2.30	1,402.30
		12,272.89
Expended—1901 to 1911	10,799.92	
1912	1,464.07	12,263.99
Balance		8.90

Plant Fund (Conservatory Fund)

1900 to 1911

Subscriptions	5,676.55	
Refunds	24.97	
Sales	303.00	6,004.52
Subscribed 1912	700.00	
Sales	150.00	
Refunds	19.99	869.99
		6,874.51
Expended—1900 to 1911	5,990.09	
1912	864.36	6,854.45
Balance		20.06

Special Book Fund

1899 to 1911

Subscriptions	23,672.88	
Refunds	21.23	
Sales	100.25	23,794.36
Subscribed 1912		4,050.00
		27,844.36
Expended—1899 to 1911	23,704.43	
1912	3,950.05	27,654.48
Balance		189.88

Summary, Special Garden Accounts

Contributions—1899 to 1911.....	73,012.88	
Sales and Refunds.....	2,486.65	75,499.53
Contributed 1912.....	10,000.00	
Sales and Refunds.....	172.29	10,172.29
		85,671.82
Expended—1899 to 1911.....	75,324.25	
1912.....	10,122.13	85,446.38
Balance.....		225.44

4. Charles Finney Cox Memorial Fund

Subscribed 1912.....	5,075.00
Expended 1912.....	1,500.00
Balance.....	3,575.00

5. Garden Accounts

A. Special Income

Income of Lydig Fund (Publications)

Appropriated.....		2,400.00
Expended—Salary for Editorial Assistance.....	360.00	
Miscellaneous.....	1,295.70	1,655.70
Balance.....		744.30

Income of Mills Fund

Docentry

Appropriated.....		600.00	
Less—Transferred to Lectures and Lantern Slides.....	20.00		
Less—Transferred to Laboratories.....	100.00	120.00	480.00
Expended.....			480.00

Horticultural Prizes

Appropriated.....			400.00
Expended—For Prizes.....		381.00	
For Postage Notices to Members.....		12.00	393.00
Balance.....			7.00

Laboratories

Appropriated		500.00	
Transferred from Docentry	100.00		
Less—Transferred to Lectures and Lantern Slides	25.00	75.00	575.00
Expended—Tropical Laboratory		295.40	
Miscellaneous		267.29	562.69
Balance			12.31

Lectures and Lantern Slides

Appropriated		400.00	
Transferred from Docentry	20.00		
Laboratories.	25.00	45.00	445.00
Expended—Lectures		180.00	
Miscellaneous		264.52	444.52
Balance			.48

Photography

Appropriated			400.00
Expended—Salary of Photographer		300.00	
Miscellaneous		84.96	384.96
Balance			15.04

Summary, Income of Mills Fund

Appropriated	2,300.00
Expended	2,265.17
Balance	34.83

Income of Students' Research Fund (Aid for Students' Research)

Appropriated	350.00
Expended	350.00

Income of Stokes Fund (Preservation of Native Plants)

Appropriated	400.00
Expended	400.00

B. General Income

Assistance for Treasurer

Appropriated	300.00
Expended	290.00
Balance	10.00

Circulars for Membership

Appropriated	300.00	
Less—Transferred to Special Assistance	30.00	270.00
Expended		265.06
Balance		4.94

Contribution to Maintenance, to Supplement City Appropriation

Labor.

Appropriated	6,700.00		
Transferred from Publications	300.00		7,000.00
Expended—Weekly Pay Rolls	5,681.25		
Extra Guard Duty and Overtime	299.07		
Salaries—Gardeners	868.34		
Keeper ..	20.00		
Driver ...	50.00		
Painter ..	30.33	968.67	6,948.99
Balance			51.01

Supplies

Appropriated	1,500.00
Expended	1,488.87
Balance	11.13

Special Assistance

Appropriated		2,500.00	
Transferred from Circulars for Membership	30.00		
Transferred from Investigations at other Institutions	40.00	70.00	2,570.00
Expended—Salaries—Assistant Curator ..	962.50		

Museum Aids..	1,130.83		
Clerk.....	120.00		
Janitors.....	50.00	2,263.33	
Miscellaneous .		302.50	2,565.83
Balance.....			4.17

Contingent Fund

Appropriated.....		1,100.00
Expended.....		1,099.17
Balance.....		.83

Summary—Contribution to Maintenance

Appropriated.....	11,800.00	
Transfer.....	370.00	12,170.00
Expended.....		12,102.86
Balance.....		67.14

Expenses of Consulting Chemist

Appropriated.....		300.00
Expended.....		300.00

Investigations at other Institutions

Appropriated.....	200.00	
Less—Transferred to Special Assistance	40.00	160.00
Expended.....		158.40
Balance.		1.60

Insurance

Appropriated.....	600.00	
Less—Transferred to Museums and Herbarium.....	100.00	500.00
Expended.....		494.10
Balance.....		5.90

Museums and Herbarium

Appropriated.....	800.00	
Transferred from Insurance.....	100.00	900.00
Expended—Expenses of the Curator of the Economic Collections	600.00	
Miscellaneous.....	282.70	882.70
Balance...		17.30

Publications

Appropriated	2,400.00	
Less—Transferred to Labor	300.00	2,100.00
Expended		2,061.09
Balance		38.91

Salary of Secretary

Appropriated	1,500.00
Expended	1,500.00

Salary of Membership and Publications Clerk

Appropriated	960.00
Expended	960.00

Summary—Garden Accounts

A. Special Income

Appropriated	5,450.00
Expended	4,670.87
Balance	779.13

B. General Income

Appropriated	19,160.00
Expended	19,014.21
Balance	145.79

Recapitulation, Garden Accounts

Appropriated	24,610.00
Expended	23,685.08
Balance	924.92

6. Expended from Funds of the Garden

Special Garden Accounts 1912	10,122.13	
Garden Accounts	23,685.08	33,807.21
Charles Finney Cox, Memorial Fund		1,500.00
Total		35,307.21

Respectfully submitted,

Walter S. Groesbeck,

Accountant.

E. and O. E.

New York, December 31, 1912.

REPORT OF THE CHAIRMAN OF THE SCIENTIFIC DIRECTORS

To the Board of Managers of the New York Botanical Garden.

Gentlemen: I have the honor to submit the following report from the Scientific Directors for the year 1912.

Regular meetings of the Scientific Directors were held on April 13, June 8, and October 12, besides a special meeting on May 11, and an adjourned meeting on November 9.

The most important business of the year was transacted at the meetings of April 13 and May 11, in relation to the readjustment of the salaries of the members of the staff, and the employment of additional museum aids.

At the first named meeting, Professor Lee was appointed a committee of one to meet with the Director-in-Chief and his Assistant to consider this subject, and to report at a special meeting of this Board. At the special meeting of May 11, Professor Lee reported in detail, submitting a digest of the work and publications of the members of the staff. As a result of this report resolutions were adopted to the effect that the salaries of our staff-members were much lower than those paid to men in similar positions in other scientific municipal institutions in this City, and were inadequate both to the present high cost of living and to the scientific standing of the men involved.

Also, that the scientific prestige of the Garden was threatened by the large amount of mechanical labor placed upon the shoulders of its scientific men, and that the solution of this problem lay in a material increase in the number of museum aids.

The Director-in-Chief was requested to present these resolutions at the next meeting of the Board of Managers, accompanying them with statements of the service rendered to the Garden by members of the staff, and of their scientific records.

It was also resolved that the Board of Managers be

requested to establish the position of Associate Curator for such members of the staff as may be considered capable of ultimately assuming the duty of curatorships.

The recommendations contained in these resolutions were favorably considered by the Board of Managers at their next meeting, and provision was made for substantial increases in the salaries of the members of the staff, and for additional museum assistance.

Although conditions are such that the full benefit of these new provisions cannot be at once realized, yet the action here reported must be regarded as of vital importance to the scientific success and progress of the Garden. The permanent retention in the staff of men whose scientific work is of a more or less continuous character is requisite to the integrity of the results, as well as to economy in the expenditure of time, and the new arrangements are highly conducive to such permanency.

We are happy to record also that Mrs. Elizabeth G. Britton was appointed by the Board of Managers as Honorary Curator of the Moss Collections, at its meeting of May 23.

Another important change affecting the staff members is the printing after their titles in the Garden publications of designations of the field of botany in which their major activities respectively lie.

The scientific work of the Garden for the year has been both extensive and important, as may be seen by reference to the reports of the Curator, the Librarian and the Director of the Laboratories.

The completion of the new museum cases opens the way for extensive additions to our exhibits during 1913.

The explorations of the year have included an expedition by the Director-in-Chief, accompanied by Mrs. Britton and Mr. Wilson, to the West Indies, with the special object of completing our information concerning the cactaceous flora of that region; one by the Director-in-Chief for the study of the autumnal flora of Bermuda; one by Dr. Small to Florida,

in company with Professor Hugo de Vries, and work in Cuba by Dr. Shafer.

Material additions have been made to our collections of living Cactaceae, and especially to our colored drawings of these plants, as well as of the Orchidaceae.

Important researches have been conducted concerning the diseases of our forest trees and the best methods of checking them.

The collection and study of fungi has proceeded most actively and effectively, especially on the part of Assistant Director Murrill, and our MYCOLOGIA, which is largely devoted to recording the results of this work, is universally recognized as an authoritative publication in this department of botany.

The Scientific Directors have, at two meetings, discussed the practicability of publishing a large, handsomely illustrated quarto work on American fungi, and the subject is still under consideration.

The Garden has participated in a number of scientific meetings throughout the country, special mention being here made of a convention of scientific societies held in Washington, D. C., a convention held at Harrisburg, Pa., for the discussion of the chestnut canker, a celebration by Pittsburgh University and the Centennial Celebration of the Philadelphia Academy of Science.

A notable accomplishment of the year has been the completion of the Cox memorial fund, and the installation in the Library, in a special case, of the Cox collection of Darwiniana.

The monthly conferences of the staff which have been held during the year are also worthy of special notice. These conferences tend not only to promote effectiveness in individual work, but also solidarity in the general work of the staff, by keeping its several members informed as to the mutual relations of their respective contributions.

The public educational work of the Garden has shown distinct progress. Not only have the regular spring and fall

courses of public lectures been given, but so marked was the increase in attendance upon, and interest in the fall course, that it was decided to try the innovation of a short winter course also. The results of this experiment have been quite satisfactory.

A similar increase has been observed in the public interest in our provision of guides for conducting the public about the grounds.

The regular lectures and demonstrations to the children of the public schools were given in the fall, but no arrangements for the spring were made by the school authorities.

In connection with the lecture work, reference should be made to the rearrangement of the lantern slide collection in new cases, which greatly facilitates their use and also promotes their safety and preservation.

No other improvement of the year, perhaps, has been relatively so productive of good results as the indication upon the cases of the Herbarium of the location of the different families. Those who are using these cases daily become familiar with such location, but to others, fully one half of the time formerly consumed in consulting this herbarium is now saved.

The membership of our Board has been strengthened by the addition to it of Mr. Eugene P. Bicknell, whose critical studies of our local flora have contributed greatly to the accuracy of our knowledge concerning it.

As heretofore, we have to acknowledge, with grateful appreciation, the generosity of contributors to our special funds, by which alone we have been enabled to maintain the extent and quality of our scientific accomplishments.

Respectfully submitted,

H. H. RUSBY,

Chairman.

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS FOR THE YEAR 1912

To the Board of Managers of the New York Botanical Garden.

Gentlemen: The number of new members who have qualified during the past year is 89. The number of annual members is now 823; life members 156; sustaining members 20; fellowship members 5.

Of these, 33 are now in arrears for dues for 1912, 6 are in arrears for 1911 and 1912.

Dues have been collected to the amount of $9,115, which has been transmitted to the Treasurer as received.

Four persons have qualified as life members by the payment of $250 each. These sums have been transmitted to the Treasurer for credit to the endowment fund.

A complete list of all classes of members to date is herewith submitted.

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Arthur Ryle,
Harry Sachs,
Paul J. Sachs,
Clarence Sackett,
Mrs. Russell Sage,
Daniel C. Sands,
Miss G. W. Sargent,
Herbert L. Satterlee,
Dr. A. T. Schauffler,
Carl Schefer,
Miss Mary E. Schell,
Mrs. H. M. Schieffelin,
Dr. Wm. J. Schieffelin,
Rudolph E. Schirmer,
Miss Jane E. Schmelzel,
D. Schnakenberg,
Henrich Schniewind, Jr.,
C. M. Schwab,
Gustav Schwab, Jr.,
Geo. S. Scott,
Robert Scoville,
Edward M. Scudder,
Alonzo B. See,
Charles E. Seitz,
Prof. Edwin R. A. Seligman,
Jefferson Seligman,
E. W. Sells,
Alfred Seton,
George R. Sheldon,
Arthur M. Sherwood,
Wm. Shillaber,
Henry Siegel,
John W. Simpson,
Dr. Frank D. Skeel,
Francis Louis Slade,
Benson B. Sloan,
Samuel Sloan,
Mrs. Samuel Sloan,

Albert K. Smiley,
Daniel Smiley,
Chas. F. Smillie,
Dr. A. Alexander Smith,
Mrs. Annie Morrill Smith,
F. M. Smith,
Mrs. Geo. W. Smith,
Pierre J. Smith,
R. A. C. Smith,
E. G. Snow,
E. G. Soltmann,
Mrs. Charlotte Sorchan,
W. M. Sperry,
Paul N. Spofford,
Miss Anna Riker Spring,
J. R. Stanton,
James H. Stebbins,
James R. Steers,
Chas. H. Steinway,
Fred. T. Steinway,
Wm. R. Steinway,
Olin J. Stephens,
Benjamin Stern,
Louis Stern,
Sereno Stetson,
Alexander H. Stevens,
Frederic W. Stevens,
Dr. Geo. T. Stevens,
Lispenard Stewart,
Wm. R. Stewart,
Miss Clara F. Stillman,
Dr. D. M. Stimson,
James Stokes,
Albert Strauss,
Chas. Strauss,
Frederick Strauss,
Mrs. Adeline Torrey Strong,
Benj. Strong, Jr.,
F. K. Sturgis,
Mrs. F. K. Sturgis,
Mrs. Geo. Such,
Mrs. James Sullivan,
Miss Mary Taber,
Henry W. Taft,
Edward N. Tailer,
James Talcott,
Leon Tanenbaum,
C. A. Tatum,
Miss Alexandrina Taylor,
George Taylor,
Henry R. Taylor,
Stevenson Taylor,
W. A. Taylor,
C. H. Tenney,
H. L. Terrell,
Jno. T. Terry,
Thomas Thacher,
Miss M. J. Thayer,
Seth E. Thomas, Jr.,
L. S. Thompson,
Dr. W. Gilman Thompson,
Jonathan Thorne,
Samuel Thorne, Jr.,
W. V. S. Thorne,
Myles Tierney,
Louis C. Tiffany,
James Timpson,
J. Kennedy Tod,
William Tousey,
C. D. Tows,
P. S. Trainor,
A. F. Troescher,
Frederick K. Trowbridge,
Dr. Alfred Tuckerman,
Paul Tuckerman,
Geo. E. Turnure,
Benjamin Tuska,
E. S. Twining,
Mrs. Eliza L. D. Tysen,
E. S. Ullman,

Theodore N. Vail,
Augustus Van Cortlandt,
Alfred G. Vanderbilt,
D. B. Van Emburgh,
E. H. Van Ingen,
Edgar B. Van Winkle,
Hon. Robert A. Van Wyck,
Richard C. Veit,
Thos. F. Vietor,
Frank Vincent,
Herman Vogel,
John Wagner,
Wm. I. Walter,
Artemus Ward,
Mrs. John Hobart Warren,
Mrs. John J. Watson,
Thomas L. Watt,
F. Egerton Webb,
Mrs. John A. Weekes,
Chas. Wehrhane,
Camille Weidenfeld,
Charles H. Weigle,
Mrs. C. Gouveneur Weir,
Mrs. Samuel W. Weiss,
Mrs. John Wells,
Mrs. Robert E. Westcott,
Geo. Westinghouse,
Mrs. Alice T. Wheelock,
Dr. Wm. E. Wheelock,
Miss Caroline White,
Horace White,
John J. White, Jr.,
Miss Gertrude Whiting,
Clarence Whitman,
Miss Margaret S. Whitney,
Wm. Wicke,
Edward A. Wickes,
D. O. Wickham,
Mrs. George G. Williams,
Mrs. I. T. Williams,
Mrs. Percy H. Williams,
Richard H. Williams,
W. P. Willis,
Charles T. Wills,
Prof. Edmund B. Wilson,
George T. Wilson,
Mrs. H. S. Wilson,
Miss Margaret B. Wilson,
Egerton Winthrop,
Grenville L. Winthrop,
Mrs. Robt. Winthrop,
Mrs. Frank S. Witherbee,
Dr. R. A. Witthaus,
Ernst G. W. Woerz,
S. Herbert Wolfe,
Emil Wolff,
Lewis S. Wolff,
Mrs. Cynthia A. Wood,
Henry R. Wood,
Prof. R. S. Woodward,
Mrs. William Woodward, Sr.
W. H. Woolverton,
P. B. Worrall,
Miss Julia Wray,
Mrs. J. Hood Wright,
A. Wurzburger,
Mrs. A. Murray Young,
Edw. L. Young,
Andrew C. Zabriskie,
Mrs. Anna M. von Zedlitz,
Mrs. John E. Zimmermann,
August Zinsser,
Charles Zoller,
O. F. Zollikoffer.

REPORT OF THE TREASURER

To the Board of Managers of the New York Botanical Garden.

Gentlemen: Herewith I submit a statement of my receipts and disbursements during the year 1912, and a balance sheet from my ledger as of December 31, 1912.

Respectfully yours,
James A. Scrymser,
Treasurer.

Receipts and Disbursements

Receipts

Balance as per last annual report		$ 5,341.70
Contributions of the City towards development and maintenance		87,223.96
Income from investments:		
Credited General Income Account:		
5 per cent. on $50,000 Southern Railway Co. First Consolidated Mtge. Bonds	$ 2,500.00	
4.5 per cent. on $50,000 Ches. & Ohio R. R. Co. General Mtge. Bonds	2,250.00	
4 per cent. on $50,000 Erie R. R. Co. Prior Lien Bonds	2,000.00	
4 per cent. on $59,000 Erie R. R. Co. Penn. Collat. Trust Bonds	2,360.00	
4 per cent. on $50,000 Reading R. R. Co. Jersey Central Collat. Trust Bonds	2,000.00	
4 per cent. on $24,000 Northern Pacific R. R. Co. St. Paul & Duluth Division Bonds	960.00	
4 per cent. on $30,000 Northern Pacific Co. Gt. Northern, C. B. & Q. Collat. Trust Bonds	1,200.00	

4 per cent. on $10,000 N. Y. City 4 per cent. Stock of 1959	400.00	13,670.00
Credited Income of D. O. Mills Fund: 6 per cent. on $50,000 Can. So. First Mtge. Extended Bonds		3,000.00
Annual Dues		8,130.00
Interest at 3 per cent. on balances with J. P. Morgan & Co.		247.07
Proceeds Sales of Merchandise		52.85
Life Membership Fees		1,000.00
Fellowship Members' Fees		500.00
Sustaining Members' Fees		525.00
Subscriptions to "North American Flora," sales of Publications, etc., credited Income of David Lydig Fund		2,116.32
Contributions, etc., to Special Book Fund		4,050.00
Contributions, etc., to Plant Fund		869.99
Contributions, etc., to Exploration Fund		3,850.00
Contributions, etc., to Museum and Herbarium Fund		1,402.30
Contributions, etc., to Students' Research Fund		85.00
Contribution to Charles Finney Cox Memorial Fund		5,075.00
		$137,139.19

Disbursements

Expenses paid through Director-in-Chief:		
Account of City Appropriations	$87,223.96	
On General Account for vouchers paid	22,170.45	
Special Book Fund for books	3,734.64	
Plant Fund for purchase of plants.	923.21	
Exploration Fund for specimens, etc.	3,963.40	
Museum and Herbarium Fund for purchases, etc.	1,493.89	
Income of Students' Research Fund for grants	350.00	
Income of David Lydig Fund for publications	3,609.37	

Income of D. O. Mills Fund for sundries.....	1,508.29	
Income of Stokes Fund for printing	400.00	
On account of Charles Finney Cox Memorial Fund.....	500.00	125,877.21
Balance: Cash in hands of Treasurer		11,261.98

Ledger Balances, December 31, 1912.

Credit

Permanent Funds

Endowment Fund..	$314,010.00
Darius Ogden Mills Fund.....	50,000.00
David Lydig Fund—Bequest of Chas. P. Daly.....	34,149.86
Stokes Fund.....	3,000.00
Students' Research Fund.....	3,069.50

Temporary Funds

Special Book Fund for Library..	468.04	
Plant Fund, for plants.....	23.56	
Exploration Fund.....	8.35	
Museum and Herbarium Fund.	48.54	
Income of Students' Research Fund...	88.54	
Income of Stokes Fund..... ...	238.73	
Income of D. O. Mills Fund..... ...	486.86	
Charles Finney Cox Memorial Fund....	4,575.00	$410,166.98

Debit

Investments		
Net Cost of $50,000 Ches. & Ohio Ry. Co. Genl. Mtge. Bonds..		
$50,000 Southern Ry. Co. 1st Consol. Mtge. Bonds.....		
$50,000 Erie R. R. Co. Prior Lien Bonds.....		
$59,000 Erie R. R. Co. Penn. Coll. Trust Bonds		
$50,000 Reading R. R. Co. Jersey Cent. Coll. Trust Bonds .		$362,549.18
$24,000 Nor. Pac. R. R. Co. St. Paul & Duluth Div. Bonds..		
$30,000 Nor. Pac. Gt. Nor. C. B. & Q. Coll. Trust Bonds.....		
$10,000 N. Y. City 4 per cent. Stock, 1959.....		
$50,000 Can. So. Ry. Co. First Mtge. Ext. Bonds		
Director-in-Chief, Working Fund...	25,000.00	
General Income Account, balance borrowed from permanent funds.	8,731.86	
Income of David Lydig Fund, balance borrowed from permanent funds.....	2,623.96	
Cash in hands of Treasurer.....	11,261.98	
	$410,166.98	$410,166.98

REPORT OF THE SPECIAL AUDITOR

Treasurer's Account for the Year 1912

Room 3111, Grand Central Terminal,
New York, February 6, 1913.

Mr. Edward D. Adams,
Chairman, Finance Committee, New York Botanical Garden,
71 Broadway, New York, N. Y.

Dear Sir:

This is to certify that by authority of my appointment at the annual meeting, January 13, 1913, I have examined the books and accounts of the Treasurer of the New York Botanical Garden for the year nineteen hundred and twelve (1912), together with their proper vouchers, and that I find the balance sheet and the Treasurer's statement of receipts and disbursements attached hereto, to be correct.

I have also examined the various investment securities and find the same to be as reported in the said balance sheet, with the exception of the $50,000 Canada Southern Railway Company First Mortgage Extended Bonds, reported therein, which bonds matured January 1, 1913, and have been redeemed. In place of these there are now included among the securities $50,000 Interborough Rapid Transit Co. Gold Mortgage 5 per cent. Bonds, Series A, due 1952.

Respectfully submitted,

A. W. Stone,
Special Auditor.

Director-in-Chief's Account for the Year 1912

Room 3111, Grand Central Terminal,
New York, February 6, 1913.

Mr. Edward D. Adams,
Chairman, Finance Committee, New York Botanical Garden,
71 Broadway, New York, N. Y.

Dear Sir:

This is to certify that I have examined and audited the financial books and accounts of the Director-in-Chief of the New York Botanical Garden for the year nineteen hundred and twelve (1912), and that I find the same to be correct, and the cash balance to be as stated in the current cash book.

In accordance with recent practice, I have not included in this auditing the examination of the vouchers for City maintenance or construction work paid for by the City as such vouchers have been found proper and in order by the City Authorities, and it was decided in 1904 by the Chairman of the Finance Committee that a further examination of them was unnecessary. By like authority I have omitted also a detailed examination of the annual membership dues account. These dues are received by the Director-in-Chief and forwarded by him to the Treasurer, the former keeping a detailed record of the same.

Respectfully submitted,

A. W. Stone,
Special Auditor.

VOL. 8 NO. 30

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN

[ISSUED APRIL 4, 1914]

CONTENTS:

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1913 253

Report of the Assistant Director 264

Report of the Head Gardener 269

Report of the Head Curator of the Museums and Herbarium 276

Report of the Honorary Curator of the Economic Collections 283

Report of the Director of the Laboratories . . . 284

Report of the Bibliographer 290

Report of the Librarian 292

Report of the Superintendent of Buildings and Grounds . 294

SCHEDULE OF EXPENDITURES DURING THE YEAR 1913 . . 298

REPORT OF THE CHAIRMAN OF THE SCIENTIFIC DIRECTORS . 302

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS FOR THE YEAR 1913 309

REPORT OF THE TREASURER FOR THE YEAR 1913 . . . 324

REPORT OF THE SPECIAL AUDITOR 329

BULLETIN
OF
The New York Botanical Garden

Vol. 8 No. 30

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1913

(*Accepted and ordered printed, January 12, 1914.*)

To the Board of Managers of the New York Botanical Garden.

Gentlemen: I have the honor to submit herewith my report as Secretary and Director-in-Chief for the year ending January 12, 1914.

The development of the institution has been continued during the year and its usefulness has been increased. Permanent construction work by contract under city appropriations includes the completion of about 2,000 running feet of park wall and fence on the eastern boundary along the Bronx Boulevard; retaining walls at the Bedford Park Boulevard entrance and at the Woodlawn Road entrance; and a small ornamental shelter-house on the eastern border of the herbaceous grounds; city construction appropriations are now completely expended. Permanent construction work by Garden laborers includes the building of a path 345 feet long connecting the path system and flower gardens at conservatory range no. 1 with the front approach to the museum building; the partial building of a path 617 feet long northward through the pine collection from the west end of the flower gardens at conservatory range no. 1; and the partial building of a loop of the path system of the north meadows, near the Bronx River at its bend along the river woods, 588 feet long.

Considerable filling and grading has been continued at the

Woodlawn Road entrance, the earth supplied by contractors engaged in excavating cellars in the vicinity, amounting to several thousand cubic yards, and dumped without expense where directed, shaping the surfaces so as to now permit the building of the path system of the northwestern corner of the grounds and the planting of that area. Following the completion of the Bronx Boulevard boundary fence, the grounds at the Bleecker Street entrance were graded and planted with shrubs and trees, and a sodded grass gutter 500 feet long, was built along the higher portion of this wall to protect its foundations from rain-storms. Banks along the river road and at the Bedford Park Boulevard entrance have been regulated, graded and planted.

The natural features of the reservation have been protected against fire and vandalism and their beauty has suffered no deterioration. At conservatory range no. 1, additional flower gardens aggregating 890 feet in length, averaging 8 feet in width, were graded and planted, backed by plantations of low evergreens, made possible by a gift of $1,500 from Mr. James A. Scrymser; at the east end of this conservatory, a new rose garden 250 feet long was installed, and considerable additional arboretum planting was accomplished through gifts aggregating $300 by Mrs. Florence Lydig Sturgis.

The collections of hardy herbaceous perennials, of shrubs and of trees have been increased by many plants obtained from various sources; special attention has been given to the hardy herbaceous perennials. Noteworthy additions have also been made to the collections under glass, among them many cacti obtained through our cooperation with the Carnegie Institution of Washington in the investigation of that family of plants; six tall palms through the continued interest of Mrs. Finley J. Shepard; and many plants brought by our collecting expedition in the West Indies and by exchange with other institutions. The work of labeling the plant collections has been continued, both the grounds and the greenhouses thus becoming museums of living plants.

The number of species and varieties under glass and in the open is 13,305; most of them are now labeled, and in some cases, such as common trees, as many as 50 individuals of a kind are labeled.

The museums have been enriched by authentic specimens of economic products, noteworthy among them being a collection of raw materials and volatile oils used in perfumery, presented by the Manufacturing Perfumers' Association; by rare fruits and seeds from various sources; and by photographs, drawings and an elegant series of paintings of the larger fungi of the vicinity, and other paintings, executed by Miss Mary E. Eaton. The herbarium has been increased by 49,000 specimens from all parts of the world, mainly by exchange with other institutions and by our own expeditionary work. Bound books added to the library aggregate 1,352 volumes. The laboratory equipment was increased by additional microscope lenses and other apparatus. Experimental work in plant breeding was continued along several lines. Many advanced students and investigators from colleges, agricultural stations and universities have been given facilities for their researches over a wide range of plant life and plant phenomena. Considerable investigational work has been accomplished by members of the staff, but largely outside of required time of attendance. The correspondence of the Garden is increasing; an attempt is made to answer all of the numerous questions asked and to give the information requested.

Thirty-five public lectures were delivered on Saturday afternoons from April to November. Lectures and demonstrations in nature study were given to children and teachers of the public schools in April and May. The several publications have been continued. Our docents have conducted many parties of children and adults through the grounds and buildings, and the privilege of docentry instruction is highly appreciated by visitors.

Permanent funds have been increased by gifts, subscriptions and bequests aggregating over $117,000, the total permanent

funds of the corporation now aggregating over $520,000. It is desired to increase these to not less than $1,000,000, in order to permit expansion of the educational and scientific work of the institution, the increase of its collections, the further ornamentation of the grounds, and thus to develop its usefulness.

Grading and Drainage

In addition to the filling accomplished on the north side of the approach to the Woodlawn Road entrance, minor modifications of the surface have been made at a number of points, contingent upon path building work in the pinetum and on the north meadows. The filling of marshy areas in the northern part of the grounds has been continued, and two stagnant pools along the Bronx River have been partly filled. A small amount of drain-pipe has been laid at several points, connecting with main drains previously constructed, and several additional catch-basins have been built.

Roads and Paths

No new road construction has been practicable. The unfinished road through the eastern portion of the arboretum remains as it was a year ago, awaiting the paving of the Bronx Boulevard.

Path construction referred to above has reduced the unfinished system, as planned, to approximately a mile and a half. The work done this year was accomplished by Garden funds, no city construction appropriation being available. Some additional guard rails have been erected along paths, and this work is going forward during the winter. There is need for several thousand running feet of additional guard rails along paths and trails in various portions of the grounds.

The maintenance of roads has been accomplished by the Park Department, as provided in the Garden's Charter.

Bridges

All the bridges are in good repair and no considerable work has been necessary on any of them. The wooden bridge

below the water-fall near the Lorillard Mansion was removed by the Park Department during December, and its demolition has greatly increased the beauty of the river valley at that point, the view of the water-fall from the concrete bridge across the Bronx gorge being now unobstructed.

Water Supply

There has been no modification of the water supply system during the year. When funds become available, it will be desirable to construct a system of two-inch supply pipes on the terrace of conservatory range no. 1, in order to provide convenient irrigation for the new flower gardens at the foot of the terrace around that building and for plantations to be established on the terrace itself.

Buildings

The new pergola or shelter-house on the east side of the herbaceous grounds finished during the year is a useful and ornamental structure.

Much repair work has been necessary on the older buildings. The exterior roof surfaces of conservatory range no. 1 were completely painted and all glass panes carefully gone over and made secure. At power house no. 1, it was found necessary to tear down and reset the brickwork of all five boilers. Several hundred feet of new steam radiating pipes were necessary in conservatory range no. 1, and minor repairs were made to the steam mains in the museum building and the steam heating system of conservatory range no. 2. The terra-cotta cornices on the northeast side of the museum building were repointed and partially reset. Much work has been necessary on the roof of the museum building in relaying tiles, in continuation of the defects in this roof which became apparent several years ago. About one half the area of the roof of power house no. 1 was similarly relaid.

The repair work accomplished during the year continues the buildings in reasonably good condition, but considerable

work will evidently be necessary during the coming year in order to maintain this standard.

Detailed accounts of construction and maintenance will be found in the report of the Superintendent of Buildings and Grounds hereto appended.

Approach to the Bronx Park Elevated Railroad Station

During the summer, it was found that the cement surface of the approach to the Bronx Park station of the Interborough Rapid Transit Company required repairs, owing to a slight settlement of its foundations which had caused some cracks and made the surface uneven. The agreement between this railroad company and the Garden, dated April 29, 1902, provides that this platform shall be maintained in good order by the Garden and the Company will from time to time repay the reasonable expense of maintenance. Estimates for the work were obtained from three contractors, and on September 29, the work was awarded Robert R. Fox, for the sum of $375.00. It was completed in October, the contractor paid in November, and the sum of $375.00 was refunded to the Garden by the Interborough Rapid Transit Company in December.

Boundary Walls and Fences

The completion of the Park Department contract with Louis Koenig for the construction of 2,000 feet of boundary wall and fence along the Bronx Boulevard, together with suitable entrances, has greatly improved the eastern boundary of the Garden, and satisfactorily protects it from intrusion on that side. The available funds were not sufficient to enable us to construct this fence the entire length of the eastern boundary, about 300 feet more being required at its southern end.

The wall and fence built some years ago on the southwestern boundary from the elevated railroad station to the Southern Boulevard entrance is in good condition and is being repainted this winter. The fence along the Harlem

Division of the New York Central and Hudson River Railroad built several years ago by that railroad company is in good condition and has needed no repairs.

Plants and Planting

During both spring and autumn, additional planting was accomplished in many parts of the grounds and the older plantations were variously modified. The extension of the flower gardens at the foot of the terrace around conservatory range no. 1 nearly completes the installation of collections in that area, except such planting as may subsequently be done on the top of the terrace.

The new planting was mostly made possible by the following contributions to the Plant Fund.

James A. Scrymser	$1,500
Mrs. F. K. Sturgis	300
E. A. Richard	150

The collections under glass have been modified by the elimination and distribution of duplicates and by the addition of species hitherto unrepresented, the general arrangement of these collections remaining unchanged.

A detailed account of gardening operations will be found in the report of the Head Gardener hereto submitted.

Natural Features

The hemlock grove has been continuously patrolled by keepers and has lost none of its beauty. A few fires have been promptly quenched and visitors have been mostly kept to the fenced trails; the restriction of visitors to the trails has greatly enhanced the attractiveness of the woodland, much of the undergrowth which had been tramped down a few years ago being now replaced by the native plants. Lack of available funds has prevented the completion of guard rails along some of the trails, and it is most desirable that several thousand additional feet of railing be constructed in the near future. A violent rain storm on the afternoon of August 10 uprooted some forty-three trees in various parts of the grounds, but no rare species were lost.

The natural features of the river woods and of the north meadows remain essentially unchanged and, since the completion of most of the path system in these areas, have become much more accessible to visitors.

Museums and Herbarium

A detailed account of additions to the museums and herbarium and of other work on these collections will be found in the report of the Head Curator hereto appended. The general arrangement of the collections remains as before, but many of the series of specimens have been modified by addition and substitution. The additional cases provided last year for the economic museum have been filled, and more cases are now needed on all four floors of the museum building to properly display and conserve the collections still in storage.

Library

The report of the Librarian shows noteworthy progress in building up the collection of books, the addition of 1,352 bound volumes having been largely accomplished by binding volumes previously obtained and by the installation of the Charles Finney Cox collection of Darwiniana. Only small sums have been available for expenditure for the purchase of books. The desirability of financial provision for the purchase of older literature of botany and horticulture still remains, and, as I have mentioned in previous reports, many of these books are becoming increasingly more difficult to secure.

The establishment of the position of Bibliographer at the beginning of the year and the appointment of Dr. John Hendley Barnhart to this position have greatly added to the efficiency of library work and the giving out of information concerning the literature of botany and horticulture.

Laboratories

No considerable change has been made in the equipment or arrangement of the laboratories. Special facilities have

been granted to 21 advanced students and investigators during the year, as recorded in the report of the Director of the Laboratories hereto appended. The experimental garden at the nurseries has been operated in conjunction with the laboratories under the immediate direction of Dr. Stout, and several students have availed themselves of these facilities for work in plant genetics.

The tropical laboratory at Cinchona, Jamaica, rented from the Jamaica Government ten years ago was taken back by the Jamaica authorities at the termination of our lease, and will be maintained by them as a scientific station, to which properly credited students will be admitted.

Public Instruction

The Saturday afternoon public lectures from April 5 to November 29 had an average attendance of 92 auditors. Lectures and demonstrations to children and teachers of the public schools were given from April 22 to May 14. Instruction and guidance by docents has been accomplished during the year whenever application has been made for this assistance. A complete record of the educational work and of publications issued is given in the report of the Assistant Director hereto appended.

Floral Exhibitions

The exhibitions of plants and flowers held monthly during the summer in coöperation with the Horticultural Society of New York attracted large numbers of visitors. As previously, these were installed in the basement of the museum building.

Exploration

In coöperation with the Carnegie Institution of Washington, an expedition was organized in January for further studies of the West Indian flora, with special reference to the cacti; an account of the work of this expedition will be found in Garden Journal for May, 1913. Collections were made in the Virgin Islands, on St. Croix, St. Kitts, Antigua, Porto Rico, Santo Domingo and Curacao; important addi-

tions to knowledge were made and our representation of West Indian plants and specimens largely increased. Bermuda was again visited during September, with special reference to the cultivated plants of that island.* Dr. John K. Small, Head Curator, explored Lake Okeechobee, Florida, and the surrounding everglades during parts of November and December, in continuation of his previous studies on the flora of southern Florida, and returned with a large and representative collection.

Investigations

The research work of members of the Garden staff is described in their reports hereto apepnded, and that of students and visiting investigators is recorded in the report of the Director of the Laboratories. Grants from the income of the Students' Research Fund have been made to some students to aid them in prosecuting investigations, and scholarships were granted to six students.

Preservation of Native Plants

The available income of the Caroline and Olivia E. Phelps Stokes Fund for the preservation of native plants was utilized for the continuation of the illustration in color of wild flowers requiring protection from indiscriminate picking, and nine species have now been portrayed, with accompanying descriptions written by Mrs. Britton. It is proposed to group eight of these illustrations in frames, suitably lettered, and to distribute them to schools in the city and its vicinity.

Administration

Dr. W. A. Murrill, Assistant Director, and Mr. R. S. Williams, Administrative Assistant, have aided in the administrative work of the institution throughout the year. I have supervised all construction work, which has been under the immediate direction of Mr. Arthur J. Corbett, Superintendent of Buildings and Grounds. The installation of additions to the collections and the care of the collections have been under the immediate direction of Mr. George V.

* See Garden Journal for October, 1913.

Nash, Head Gardener, and of Dr. John K. Small, Head Curator. I have continued the investigation of the cactus family in coöperation with Dr. J. N. Rose, of the Carnegie Institution of Washington, and have also continued studies on the West Indian flora.

Financial Considerations

The city appropriation for maintenance of grounds, buildings and collections for 1914 is $107,163. In order to ensure satisfactory maintenance and the proper remuneration of employees, it is necessary for us to supplement this appropriation by about $20,000, as shown by our budget for 1914.

Through the work of the endowment fund committee appointed November 14, 1912, and through bequests, gifts and subscriptions, over $117,000 has been received by the Garden, the income of which will be about $5,000 annually, specified for scientific and educational work, the total Garden income from all sources being about $35,000 for 1914. It is much desired that this income be increased to at least $50,000 annually, in order to provide for the purchase of books, plants and specimens, for extension of the educational and scientific work of the institution, for the exploration of regions botanically little known, and for the further ornamentation of the grounds. The endowment fund committee was continued at the meeting of the Board of Managers held November 10, 1913, and will gratefully receive further additions to the permanent funds.

Reports Appended

Reports are appended by the Assistant Director, the Head Gardener, the Head Curator of the Museums and Herbarium, the Honorary Curator of the Economic Collections, the Director of the Laboratories, the Librarian, the Bibliographer, and the Superintendent of Buildings and Grounds; and a schedule of expenditures by the Accountant.

Respectfully submitted,

N. L. Britton,

Director-in-Chief.

REPORT OF THE ASSISTANT DIRECTOR

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF,

Sir: I have the honor to submit the following report for the year 1913.

The details of maintenance are chiefly outlined in the various reports to follow. I submit herewith for your files a complete report of the principal work done in each department during the year, made up from weekly reports to me by heads of the departments.

A special effort has been made to eradicate as far as possible the hickory bark beetle and the hemlock borer. A number of trees known to be infected were cut and burned and the stumps barked. A new cactus pest has been kept in check by continued disinfection and careful quarantine.

Publications

JOURNAL

The Journal has been published for each month during the year, making a volume of 230 pages, with 20 plates.

MYCOLOGIA

This periodical has appeared on alternate months during the year, making a volume of 329 pages, with 33 plates and 1 figure.

NORTH AMERICAN FLORA

Volume 15, part 1, was issued June 14, and Volume 15, part 2, on August 8. These two parts contain descriptions of mosses, including Sphagnaceae—Leucobryaceae, by Albert L. Andrews, Elizabeth G. Britton, Julia T. Emerson, and Robert S. Williams.

Volume 22, part 5, containing descriptions of Rosaceae, by Per Axel Rydberg, appeared December 23, 1913.

BULLETIN

Bulletin no. 29, with 82 pages, was issued March 18, 1913. It contains the annual reports of the Director-in-Chief and other officers for the year 1912.

Contributions

Contributions by members of the staff or students of the Garden, reprinted during the year from other than Garden publications, are as follows:

No. 156. "Studies on the Rocky Mountain Flora—XXVIII," by Per Axel Rydberg.

No. 157. "New Ferns from Tropical America—II," by Margaret Slosson.

No. 158. "Studies on the West Indian Vernonieae, with One New Species from Mexico," by Henry Allan Gleason.

No. 159. "A Case of Bud-Variation in *Pelargonium*," by A. B. Stout.

No. 160. "Studies on the Rocky Mountain Flora—XXIX," by Per Axel Rydberg.

Lectures

Public Lectures

Illustrated public lectures on botanical subjects have been given in the museum building on Saturday afternoons from April to the end of November, as outlined below. The total attendance for the year has been 3,230, averaging 92 for each of the 35 lectures; the maximum attendance being 247 on September 13.

April 5. "Explorations in Mexico—I. Veracruz to Jalapa," by Dr. W. A. Murrill.

April 12. "Botanical Observations of an Ornithologist in the Orient," by Mr. C. W. Beebe.

April 19. "Flowers for the Spring Garden," by Mr. G. V. Nash.

April 26. "Salient Features of Native Trees," by Dr. N. L. Britton.

May 3. "The Scenery and Flora of Colorado," by Dr. F. J. Seaver.

May 10. "Some Pacific Coast Seaweeds," by Dr. M. A. Howe.

May 17. "The Flora of the Rocky Mountains," by Dr. P. A. Rydberg.

May 24. "Botanic and Scenic Features of the Dells of the Wisconsin River," by Dr. A. B. Stout.

May 31. "Evergreens: Their Selection and Care," by Mr. G. V. Nash.

June 7. "Summer Wild Flowers about New York," by Dr. N. L. Britton.

June 14. "Diseases of Fruit Trees," by Dr. Mel T. Cook.

June 21. "Some Scenic and Floral Features of Florida," by Dr. J. H. Barnhart.

June 28. "Botanical Expeditions to the Bahamas," by Dr. M. A. Howe.

July 5. "The Hempstead Plains: A Natural Eastern Prairie," by Mr. Norman Taylor.

July 12. "Swamps: Ancient and Modern," by Dr. Arthur Hollick.

July 19. "The Flora and Scenery of the Southern Rocky Mountains," by Dr. P. A. Rydberg.

July 26. "Water Gardens," by Mr. G. V. Nash.

August 2. "American Desert Plants," by Dr. William Trelease.

August 9. "The Biology of Cheese," by Dr. Charles Thom.

August 16. "Wild Flowers of Late Summer," by Dr. N. L. Britton.

August 23. "Some Floral and Scenic Features of Jamaica," by Dr. M. A. Howe.

August 30. "The Mammoth Trees of California," by Dr. Arthur Hollick.

September 6. "Shade Trees and Their Enemies," by Dr. F. J. Seaver.

September 13. "A Visit to the Panama Canal Zone," by Dr. M. A. Howe.

September 20. "Scenic and Botanical Features of Devil's Lake, Wisconsin," by Dr. A. B. Stout.

September 27. "Explorations in Mexico—II. Mexico City to Cuernavaca," by Dr. W. A. Murrill.

October 4. "The Nature and Classification of Vegetable Foods," by Dr. H. H. Rusby.

October 11. "The Digestibility of Vegetable Foods," by Prof. W. J. Gies.

October 18. "Cereal Foods," by Mr. G. V. Nash.

October 25. "Starchy and Sugary Foods," by Dr. R. A. Harper.

November 1. "Vegetable Foods of the American Indians," by Dr. A. B. Stout.

November 8. "Tropical Vegetable Foods," by Dr. H. H. Rusby.

November 15. "Edible Fungi," by Dr. W. A. Murrill.

November 22. "The Selection and Preparation of Vegetable Foods," by Miss Bertha E. Shapleigh.

November 29. "The Uses and Characteristics of Palms," by Dr. N. L. Britton.

School Lectures

The usual lectures and demonstrations were given in the spring to the public school children of the 4B and 5B grades, of the Borough of the Bronx, under the auspices of the Board of Education, as follows:

Grade 4B

Lecture I, "Seedless Plants," by Dr. M. A. Howe, was given in the morning and afternoon of Tuesday, April 22.

Lecture II, "The Cultivation of Plants," by Mr. G. V. Nash, in the morning and afternoon of Thursday, April 24.

Grade 5B

Lecture I, "Plant Products," by Dr. H. H. Rusby, in the morning and afternoon of Tuesday, April 29.

Lecture II, "Woody Plants and Plants without Wood," by Dr. F. J. Seaver, in the morning and afternoon of Tuesday, May 6.

Lecture III, "Classification of Plants," by Dr. N. L. Britton, in the morning and afternoon of Wednesday, May 14.

Scientific Meetings

The monthly conferences of members of the staff and students have been continued, and a report of each meeting has been published in the current numbers of the JOURNAL.

The Torrey Botanical Club has met each month as usual in the morphological laboratory of the museum building.

The Horticultural Society of New York, in coöperation with the New York Botanical Garden, held exhibitions of plants and flowers in the museum building on May 10 and 11, June 7 and 8, July 5 and 6, and September 6 and 7. Accounts of these exhibitions were published in the JOURNAL for June, July, August, and September.

The New York Library Club held its October meeting at the Garden on the afternoon of Thursday, October 9, with an attendance of 160. Illustrated lectures were given by Dr. N. L. Britton and by Dr. Raymond L. Ditmars.

The New York Forestry Association held a meeting on October 17 in the lecture hall of the New York Botanical Garden. An account of this meeting was published in the JOURNAL for October.

Personal Investigations

Increasing administrative and curatorial duties have left me comparatively little time to devote to investigation. However, the preparation of two parts of NORTH AMERICAN FLORA is in progress and these will probably be completed within a few months.

Several weeks were spent in Europe during the summer, mainly at Paris, Trient, and London, for the purpose of comparing American specimens of fungi with original material preserved in European herbaria. Such comparisons are a necessary basis for all reliable monographic work on American fungi.

Work has been continued on the fungous flora of tropical and western North America, a total of 74 previously undescribed species having been published by me from these regions during the year.

The popular illustrated articles on fungi in MYCOLOGIA have been continued, with the aid of colored plates and halftones. Twenty-eight species have been treated in this series during the year.

Respectfully submitted,
W. A. MURRILL,
Assistant Director.

REPORT OF THE HEAD GARDENER

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit herewith the following report for the year 1913.

Systematic Plantations

HERBACEOUS GROUNDS. There are in the herbaceous collections, including those at the nurseries, about 2,900 species and varieties. The beds in this tract number 128. Individual show labels to the number of 597 have been made for this tract. 20 family signs have also been made. The fern bed was entirely overhauled and a number of additional species included. The details of the curatorial work here and in the other herbaceous collections have been under the efficient direction, since July 1, of Mr. K. R. Boynton, Head Gardener's Assistant.

FRUTICETUM. There are about 1,750 specimens here. With those still at the nurseries, there are represented in the shrub collections about 825 species and varieties.

SALICETUM. There are here about 115 specimens, representing 40 species and varieties.

DECIDUOUS ARBORETUM. About 305 species and varieties are represented in this collection, including those native to the tract and in the nurseries. 381 show labels have been made. The principal additions here were the gift of Mrs. Florence Lydig Sturgis. This gift included 75 Japanese cherry trees and 45 miscellaneous trees, decorative forms of the English hawthorn, the red-flowered dogwood, and the horse-chestnut and *Laburnum.* The Japanese cherry

trees were added in the spring to the group already presented by Mrs. Sturgis, extending that collection through the little valley to the river road, including the triangle formed by the paths. These trees have made a very satisfactory growth during the past summer. A group of the red dogwood, 20 trees, included in the gift of Mrs. Sturgis, was located just to the south of the ash collection. The forms of the English hawthorn were put in the east end of the area devoted to the plum and apple families. The plants of *Laburnum* were placed in the apex of the triangle in the area devoted to the pea family.

PINETUM. The collections of *Chamaecyparis* and *Juniperus* located at the terrace of conservatory range 1 have been extended in each case to the plaza. A number of plants in the pinetum collections which had died or become seriously injured were replaced with other individuals. The corner opposite the conservatory, formed by the new path, was planted with 16 trees of the Colorado blue spruce, taken from the nearby conservatory beds. A group of the tiger-tail spruce, *Picea polita*, was placed in the triangle formed by the two new paths. The coniferous collections represent about 285 species and varieties, embracing about 1,115 specimens. 322 show labels have been added.

VITICETUM. There are about 50 species and varieties here.

CONSERVATORIES. The collections of tender plants, including those at the propagating houses, represent about 8,900 species and varieties, embracing 207 families and 1,510 genera. The total number of plants in the conservatories is 17,340.

Range No. 1. The collections here comprise 10,875 plants, distributed as follows: house no. 1, 291; no. 2, 378; no. 3, 463; no. 4, 494; no. 5, 1,397; no. 6, 549; no. 7, 986; no. 8, 590; no. 9, 146; no. 10, 939; no. 11, 439; no. 12, 1,179; no. 13, 502; no. 14, 754; no. 15, 1,575; cellar, 193. Show labels added, 2,122.

Range No. 2. The plants here number 6,465, distributed

as follows: house no. 1, 75; no. 2, 138; no. 3, 53; no. 4, 1,174; no. 5, 2,060; no. 6, 1,623; no. 7, 1,212; cellar and runway, 130. 46 show labels have been added.

PROPAGATING HOUSES AND NURSERIES. The plants here, excluding those under the immediate control of the director of the laboratories, number 9,097. 1,376 packets of seeds have been received, as follows: by gift, 95; by exchange, 1,307; collected on exhibitions, 16. In addition to the above, 720 packets have been derived from the collections on the grounds. House no. 2 and parts of other houses have been devoted to the plants under the control of the director of the laboratories. Houses 5 and 6 and a part of no. 1 have held the succulent plants, mainly cacti. The enclosure in the nursery has been much enlarged to accommodate the increased experimental work being carried on.

LABELING, RECORDING AND HERBARIUM. Accession numbers 37,037 to 39,307 have been recorded, making a total of 2,271 accessions. 4,579 show labels have been made, as follows: deciduous arboretum, 381; herbaceous grounds, 597; economic garden, 28; morphologic garden, 12; west border, 170; pinetum, 322; roads and paths, 78; conservatory decorative beds, 593; decorative beds, elevated approach to conservatories, 51; elevated approach border, 43; conservatory range 1, 2,122; conservatory range 2, 46; rose bed, 136.

The following plants have been acquired: by gift, 327, valued at about $650.00; by exchange, 1,087; by purchase, including 30,612 bulbs, 34,128; collections made by members of the staff and others, 1,041; derived from seeds from various sources, 2,481; total, 39,064.

650 specimens have been added to the herbarium of cultivated plants. The collections contain approximately the following number of species and varieties: conservatories, 8,900; herbaceous, 2,900; fruticetum, 825; salicetum, 40; deciduous arboretum, 305; pinetum, 285; viticetum, 50; total, 13,305.

Miscellaneous Collections

MORPHOLOGIC GARDEN. This remains about as it was last year. 12 show labels have been added.

ECONOMIC GARDEN. For the better display of the plants here and to accommodate an increased number of representatives, five new beds were added and others enlarged. This required a rearrangement of the beds devoted to foods. 28 show labels were added.

DESERT PLANTS. A large part of the collections of desert plants, in houses 5 to 8, were placed, as usual, in the beds in the court of conservatory range 1.

CONSERVATORY LILY POOLS. The collection of tender water lilies here was of unusual excellence the past summer. The Paraguay royal water lily, *Victoria cruziana*, made numerous flowers and perfected seed. The hardy water lilies also made a splendid showing. These collections of aquatics and the contrasting collections of desert plants nearby make one of the most interesting and instructive features of the institution.

AQUATIC GARDEN. Additional planting was done here. The water lilies gave a profusion of bloom during the entire summer, especially the forms of *Castalia tuberosa* and the pink hybrids of Marliac.

RHODODENDRON BANKS. In addition to the profusion of rhododendron blooms, there was a fine display during the summer of the various species of lilies planted here. Lilies do especially well among these shrubs, the soil conditions being suitable to them. The mulching of old leaves, and the consequent covering of leaf mold, with the watering, give the lily bulbs the moist cool surroundings they desire.

ROSE BED. The rose bed, at the foot of the east terrace of conservatory range 1, was installed in the spring. It is about 250 feet long and eight feet wide. It was thoroughly prepared by trenching to a depth of 18 to 24 inches, subsoiled, and enriched with manure. This preparation was fully justified by the results, for the rose delights in a deep rich soil, sending its roots down, enabling it to withstand the

trying droughts of our summers. The plants did remarkably well, making an excellent growth and coming into flower early in the summer, a profusion of bloom continuing the summer through, lasting through the fall, the last buds developing early in December. A large assortment of roses, 136 kinds, were included in the collection, represented by a little over 400 bushes, including hybrid perpetuals, hybrid teas, teas, baby ramblers, moss roses, and others. The rose is loved by all, so this bed proved of exceptional interest to visitors.

Other Decorative Plantations. Here are included the following: beds in the immediate vicinity of conservatory range 1; those at the elevated approach, west border, and along the paths from the elevated to the conservatories; and groups of shrubbery, including the collection of lilacs presented by Mr. T. A. Havemeyer.

General Horticultural Operations

For the conduct of this work, the following monthly men have been available: two foreman-gardeners, 21 gardeners, one garden aid, and four drivers for the open season. In addition to the above, the following laborers were assigned to the foreman-gardener in charge of the outside work: June to August, 21 or 22 men; September, 17 men; October, 15 men; November, 14 or 15 men. A considerable portion of the time of the laborers was employed on other than horticultural work.

In the conservatories and propagating houses, the immediate direction of the work was under Richard Richter, foreman-gardener, up to June 3, at which time he resigned, being succeeded by William Becker, formerly in charge of the propagating houses. At the same time, Fred Hyam, formerly second in charge at conservatory range 1, was put in charge of the propagating houses, being succeeded at conservatory range 1 by O'Hare. For the prosecution of the work under glass, there has been available a force, in addition to the foreman-gardener, of 15 gardeners, one garden aid, and one laborer.

The outside work has been under the direction of foreman-gardener John Finley, who has had the assistance of the remainder of the assigned force, viz., six gardeners, 13 to 21 laborers, depending on the time of the season, and four drivers.

In addition to the regular routine horticultural operations, the following new work has been done:

In the Spring

The preparation of the ground and the planting of the additional Japanese cherry trees given by Mrs. Sturgis, to which allusion has already been made. In the vicinity of conservatory range 1, the following work was accomplished: a partial overhauling of the shrub and tree planting in the decorative beds, the surplus material being used elsewhere, mainly in the pinetum; the preparation of the rose bed, about 250 feet long by eight feet wide, it being trenched and subsoiled especially for rose cultivation; the beds at the foot of the terrace, with the exception of the two long plots to the north, were planted with evergreens and deciduous shrubs, about 280 plants being used, secured from the nursery and decorative beds at conservatory range 1, all but about 25 of them evergreens; the end beds at the foot of the north terrace were planted with herbaceous plants; the small bed at each end of the series of seven was planted in the centre with evergreens and deciduous shrubs, the eight foot border with herbaceous plants. The immediate surroundings of the shelter house in the herbaceous grounds were planted with shrubs. The points at the Newell Avenue entrance were planted with Japanese barberries. A red oak tree was placed to the east of the museum building. The triangle to the east of the museum, at the entrance of the path to the economic garden, was planted with *Viburnum acerifolium*. A tree of Paulownia was placed in the triangle near the fountain enclosure, to replace the hickory removed. In the fruticetum, 26 more rose bushes were added to the decorative group between the main road and path in the vicinity of the rose family.

In the Fall

In the immediate vicinity of conservatory range 1, the following work was done: the two long plots at the foot of the north terrace were broken up and an eight foot border of herbaceous plants installed, each border about 190 feet long; the beds in the court, devoted during the summer months to a display of desert plants, were planted with early spring tulips; the circle in the plaza was also planted with early spring tulips; tulips were planted in the new decorative beds, and replacements of the same made in the old beds; plants of the knee pine and the glaucous form of the red cedar were placed in the principal corners in the court.

The banks near the railroad at the Southern Boulevard entrance were planted with *Symphoricarpos*. Shrubs and 5 red oak trees were planted west of the long bridge. To the coniferous group to the west of the long bridge, 2 plants of *Pinus parviflora* were added, and in the low ground near the aquatic garden 16 plants of the white cedar, *Chamaecyparis thyoides*, were planted. To the decorative group of willows in the fruticetum, 9 more plants were added. In the low land at the west end of the west lake, 25 plants of *Amelanchier Botryapium* were placed. In the triangle at the drinking fountain at the west end of the west lake, 16 plants of *Azalea nudiflora* were planted. On the east bank of the river road were planted 75 *Azalea nudiflora*. A screen of shrubs was placed in front of the rubbish pile at the herbaceous grounds. Shrubs and 5 elm trees were planted at the east entrance. The points on the east and west sides of the north bridge were planted with *Symphoricarpos*. Many plants of *Hibiscus*, from the collection of Dr. Stout in the nursery, were planted on both sides of the river south of the north bridge. The collection of thorns in the bed in the center of the fruticetum plaza was overhauled and replanted. The beds at the fountain were planted with tulips. Replacements of tulips were also made in the west border south. Many small tulip bulbs, derived from the plantings of the previous year but too small for use in formal

plantings, were placed in the bed of deutzias and related shrubs near the depot.

Investigations and Lectures

In addition to routine duties, I have done much work upon the orchids, with a view to their systematic treatment for NORTH AMERICAN FLORA. Much more of my time is being devoted to horticultural botany, and it is my desire to continue this.

I have given four lectures in the regular courses of public lectures at the Garden, and two of the lectures to the school children in the spring.

Respectfully submitted,
GEORGE V. NASH,
Head Gardener.

REPORT OF THE HEAD CURATOR OF THE MUSEUMS AND HERBARIUM

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I submit herewith my report as Head Curator of the Museums and Herbarium for the year 1913.

The collections under my charge were conserved and developed on the lines and by the methods outlined in my previous annual reports.

ACCESSIONS. The museum and herbarium specimens received during the year were accessioned from month to month in the JOURNAL. The methods of acquisition and the number of specimens received may be expressed as follows:

By gift and purchase.	10,799
By exchange....	8,094
By exploration....	16,907

Thus an aggregate of 35,804 specimens from nearly all parts of the world was brought together.

A total of 20,246 duplicate specimens was sent to other institutions and to individuals in exchange.

Museums

The equipment of the public museums was substantially augmented by the installation of sixteen exhibition cases in the economic museum, and by glass jars as follows:

Specimen jar 2605. Whital Tatum Company

Diameter of Body	Height to shoulder	Number
2 inches	5 inches	36
3 inches	8 inches	144
3¾ inches	10 inches	144
4½ inches	12 inches	144
	Total.....	468

Fossil Plant Museum. Floor case number 7, devoted to an exhibit of the cretaceous flora of New York City and vicinity, was rearranged and many of the old specimens replaced by better ones recently acquired. The other cases remained essentially as they were last year with the exception of the replacing of occasional specimens. Copy for labels for all unlabeled specimens has been prepared and is ready to go to the printer.

Economic Museum. The addition of the sixteen exhibition cases already referred to made possible an expansion and rearrangement of the collections of foods and fibers. Many specimens previously held in storage were interpolated in their proper places. The three more noteworthy additions to this collection were, (1), the foundation of a Perfumery Exhibit, consisting of raw materials and volatile oils, presented by the Manufacturing Perfumers' Association, (2), a large collection of crude drugs presented by Dr. H. H. Rusby, and (3), miscellaneous specimens secured through exploration by the Garden, chiefly in the West Indies. For further notes on this collection, see Report of the Honorary Curator of the Economic Collections.

Systematic Museum. The four divisions of this museum were maintained as heretofore. An important element was added to the fungous part of the Local Flora Exhibit. This is noted below.

The Synoptic Collection. With the exception of the addition of miscellaneous specimens, this division of the Systematic Museum remained as it was during the previous year.

The Local Flora Exhibit. A large number of hand-colored paintings of the local fleshy fungi was installed in their proper sequence in this collection and thoroughly labeled. This exhibit has been in preparation for several years, and will be of great importance to students of the local fungi.

Microscope Exhibit. This collection was renovated several times during the year and was kept in as good condition as possible. Slight deterioration consequent upon the nature of its construction and its constant use demands some repairs as early next year as possible.

The Plant Photograph Exhibit. No additions were made to this. Many more photographic enlargements have been prepared and are held for the further development of this exhibit.

Herbaria

The four herbarium cases mentioned in my last report were available for use at the beginning of the year. They served to temporarily and partially relieve the congestion in the fungous collection, the moss collection, and the flowering plant collection.

Large additions of herbarium specimens bearing directly on the scientific work of the Garden were secured from many parts of America, chiefly from various parts of Canada, United States, Mexico, Central America, and the West Indies. These specimens were incorporated in the permanent collection as far as received. They are of great use in our work on NORTH AMERICAN FLORA.

GARDEN HERBARIUM. This collection is becoming more complete and more serviceable every year. Valuable collections of fungi from America, Europe, and the Philippine Islands were added to it, and the Gerard fungous herbarium is being incorporated. Several rare exsiccatae of algae were secured and have been mounted. The specimens of hepatics of the Mitten and the Underwood herbaria have been in-

corporated in the general collection. All current exsiccatae of mosses, many specimens from the Mitten moss herbarium, and various other collections have enriched the large moss herbarium. Ferns from tropical America were added to the fern herbarium. Flowering plants were added from all parts of the world, but particularly from North and South America.

COLUMBIA UNIVERSITY HERBARIUM. Miscellaneous specimens of flowerless and flowering plants presented to Columbia University, together with some specimens from the Morong herbarium, were mounted and distributed into the collection. Some duplicate specimens of rare species mounted for the Garden herbarium were also incorporated in the Columbia herbarium in order to facilitate the studies in certain groups.

MOUNTING AND CONSERVING OF HERBARIUM SPECIMENS. A special attempt to mount and incorporate the accumulation of herbarium specimens yielded good results. Most of the American specimens, together with such foreign specimens as are of immediate use in current investigations, were mounted and distributed in the herbarium cases.

A total of 33,000 sheets of mounting paper was used. This represents an aggregate of about 49,000 specimens added to the permanent collections. In addition, several thousand specimens too bulky to mount on herbarium sheets were preserved in carboard boxes. The cardboard box equipment was augmented by the following supply:

	Sizes of Boxes	Number
4	×2¾× ⅝ inches	2,000
4	×2¾×1¼ inches	1,000
5½×4	×2½ inches	1,000
8	×5½×2½ inches	500
	Total.....	4,500

Investigations and Assistance

Mr. Percy Wilson, Assistant Curator, had charge of the public lectures on Saturday afternoons between April and

December, and the spring course of nature-study lectures to the pupils of grades 4B and 5B of the public schools of the Borough of the Bronx. He also arranged for all photographic work, and superintended the rearrangement of the negative and lantern-slide collections. In addition to his duty as docent three week-day afternoons, Mr. Wilson devoted considerable time to the instruction of special classes from schools all over Greater New York. His principal curatorial work has been the determination and distribution of the specimens of a large part of the collections from tropical America, principally West Indian, which were received during the year.

Mrs. N. L. Britton, Honorary Curator of Mosses, devoted most of her time during the spring to studying the collections made in the early part of the year, in the Danish West Indies, the Virgin Islands, and Porto Rico. She accompanied Dr. Britton to these islands and in company with Miss Marble, collected mosses, hepatics, lichens, and fungi, in various parts of St. Thomas and Porto Rico, and assisted in the care of the collections of flowering plants. During the summer and fall she continued exchanges with several of the larger European herbaria for specimens of Tortulaceae needed for monographic work for NORTH AMERICAN FLORA. She also accompanied Dr. Britton to Bermuda, and there made further collections of mosses, hepatics, and lichens. A series of duplicate specimens of mosses, mainly from Bermuda and Jamaica, have been prepared for distribution. A critical revision of Olaf Swartz's types of Jamaica mosses with lists of modern synonyms was prepared for the December number of the *Bulletin of the Torrey Club*. During the spring, four parts (nos. 6–9), of the series "Wild Plants Needing Protection" were published in the JOURNAL, including the "Wild Azalea," "Pink Moccasin Flower," "American Laurel," and "Flowering Dogwood." She has also delivered a lecture on "Our Native Wild Flowers," illustrated by lantern-slides, before the Garden Club of Larchmont, on the invitation of Miss Helena Flint. The accessions during the year to the moss collections included

1,632 specimens, of which a large number were Philippine Island specimens; all these have been incorporated with the permanent collection by Mr. R. S. Williams, Administrative Assistant. Mr. Williams devoted considerable time to the study of his own collections of Philippine mosses made in 1903–1905, and assisted Mrs. Britton in the determination of specimens of genera of which he has made a special study, particularly in the Dicranaceae.

Dr. H. H. Rusby, Honorary Curator of the Economic Collections, has devoted his time to securing specimens and preparing copy for labels. For further details, see report of the Honorary Curator of the Economic Collections.

Dr. Arthur Hollick, Curator, had charge of the collections of fossil plants. In addition to curatorial work in connection with the public exhibits, Dr. Hollick gave instruction to registered students in paleobotany, edited the BULLETIN of the Garden, delivered a lecture on "Swamps, Ancient and Modern," and prepared and published an article with illustrations, entitled "Pot-holes in the New York Botanical Garden." He pursued investigations on the fossil flora of Alaska and the Pleistocene flora of Canada. Leave of absence from the Garden was granted to Dr. Hollick during March, April, May, and June, in order to allow him to prosecute studies for the United States Geological Survey on the fossil flora of Alaska. In the work of labeling, installing and rearranging specimens, Mr. Edwin W. Humphreys rendered valuable voluntary assistance.

Dr. Fred J. Seaver, Curator, continued the work of naming, assorting, and mounting the fungi. Field work and collecting during the year was confined to local areas within easy reach of the Garden. This resulted in the finding of several species new to science and a material strengthening of our collections, especially those of fleshy discomycetes. Critical work on several groups of fungi has been continued, and several preliminary papers published. Work on local destructive insect pests has been continued and one paper published in the JOURNAL. Dr. Seaver continued to act as associate editor of MYCOLOGIA. Two lectures were de-

livered by him in connection with the Saturday afternoon courses and one in the nature-study course given to the pupils of grades 4B and 5B of the public schools of the Borough of the Bronx.

Dr. Marshall A. Howe, Curator, continued in charge of the collections of algae and hepaticae. The work of incorporating the Mitten and the Underwood collections of hepaticae in the general hepatic herbarium has been completed, resulting, during the year, in the mounting and distributing of 5,722 new herbarium sheets and 1,463 odd pockets of hepaticae. Of algae, 1,395 new herbarium sheets, 28 pockets, and 15 boxes have been entered in the herbarium. For the sake of preserving the actual materials from which figures and descriptions have been drawn and for facilitating microscopic comparisons of specimens, about 800 sections and other microscopic preparations of algae have been mounted in glycerine jelly on slips of mica and have been introduced into the herbarium beside the specimens.

The writer, in addition to regular curatorial work, finished monographs of the families Ericaceae and Monotropaceae for publication in NORTH AMERICAN FLORA. Some time was devoted to the study of specimens collected during exploration in tropical Florida in 1912, while studies on certain plants and plant-groups of the southeastern United States were carried on from time to time. As a side issue, I published a second edition of my "Flora of the Southeastern United States" in the spring, and also five other books which succeeded the "Flora" in the following order, "Flora of Miami," "Florida Trees," "Flora of the Florida Keys," "Flora of Lancaster County" (in collaboration with J. J. Carter), and "Shrubs of Florida." Extensive exploration was carried on in the everglades of Florida, chiefly in parts hitherto unexplored, during parts of November and December, and some time was devoted to exploration and collecting on the lower Florida keys.

Respectfully submitted,

J. K. SMALL,

Head Curator of the Museums and Herbarium.

REPORT OF THE HONORARY CURATOR OF THE ECONOMIC COLLECTIONS

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1913.

The accessions to the collections under my care number 350 specimens. Although these specimens are of a miscellaneous character, the greater majority of them pertain to the perfumery, drug and fiber divisions of the museum. The following are worthy of special note.

A set of 63 specimens of raw materials and essential oils used in perfumery was donated by the Manufacturing Perfumers' Association of America; our collection of aromatic products, previously large, has become, by this augmentation, of great value and importance. A billet of wood and a bottle of oil distilled from the wood of *Amyris balsamifera*, from Venezuela, were donated by Messrs. Magnus Mabee & Reynard, of New York; a set of 8 native fiber plants, the fibers and some articles made of them, obtained in Cuba by Dr. J. A. Shafer; the fibers of *Pouzolzia* and *Girardinia*, from the Himalaya Mountains; the leaves and barks of *Psychotria undata* and *P. Sulzneri*, a native medicine of Florida, collected by Dr. J. K. Small; the native grapes of the vicinity of Salem, Indiana, donated by Mr. William Rudder, of that place; grapes and May-pops (*Passiflora incarnata*), collected by myself near Nashville, Tennessee.

The large collection of general drug products of the year is of unusual interest and importance. Many of them represent spurious substitutes, to be exhibited in our cases beside the genuine. Among the more interesting of the drug specimens may be mentioned a section of the manna ash trunk, with the exuded manna adhering; a shrub of the tragacanth plant, with the exuded tragacanth adhering to it; a specimen of Toona gum; a specimen of the sloe berries used in making sloe gin; *Stenolobium* leaves from Mexico; a collection of rare native drugs from Japan, in the powdered state, including the roots of two species of *Paeonia;* several

specimens of ginseng, both American and Korean. From the Burbank Gardens we have received a set of living cultivated spineless forms of *Opuntia*, now growing in conservatory range no. 1.

Most of the specimens have been placed in jars, but many remain to be installed in the cases, the label printing not having been completed. A number of descriptive labels for the more important articles are ready for printing. The completion of new cases has afforded a much needed opportunity for improving the display features of the Museum.

Respectfully submitted,

H. H. Rusby,

Honorary Curator of the Economic Collections.

REPORT OF THE DIRECTOR OF THE LABORATORIES

Dr. N. L. Britton, Director-in-Chief.

Sir: I have the honor to submit the following report for the year 1913.

The Laboratories

The general arrangement of the laboratories has remained as in the previous year. Six one-twelfth oil immersion objectives, four Huyghenian oculars and one Stufen micrometer ocular were purchased for use on microscopes already supplied. At the time these objectives were fitted, all the microscopes belonging to the Garden were overhauled and cleaned, without charge, by a mechanic from the firm of E. Leitz. An inoculating and transfer chamber especially needed in certain student investigations is now being made.

Experimental Garden and Greenhouse

The experimental garden was enlarged early in the year according to your direction and an area in the propagating garden was utilized for the growing of *Hibiscus* and *Carex*. The facilities afforded by the experimental garden and greenhouse have been utilized fully throughout the year in the

various invesitgations carried on by students, by Professor R. A. Harper and by myself. Cold frames constructed last spring will relieve to a considerable extent the usual congestion of the greenhouse during the spring months. A work room arranged for student use at the propagating houses would be a desirable feature.

Some additions have been made to the species grown because of their special interest to botanists. Among these are *Oenothera grandiflora*, *O. Traceyi* and three biotypes of *O. cruciata*. Four types of tomato-nightshade chimeras produced by Dr. Hans Winkler have been obtained through the courtesy of Dr. Winkler. The history and description of these chimeras was given in an article in the August number of the Garden JOURNAL. From the Bureau of Plant Industry, United States Department of Agriculture, the Garden obtained a plant descended through vegetative propagation from the hybrid between the carnation and the sweet-william made by Thomas Fairchild about 1710. It is claimed that this is the first plant hybrid produced experimentally. Continued efforts will be made to assemble plants of particular interest to students of heredity.

Routine Duties

The duties concerned with the taking of the meteorological records and the secretaryship of the monthly conferences have, during the year, been performed along the lines indicated in my previous report. The duties incident to the editorship of THE JOURNAL OF THE NEW YORK BOTANICAL GARDEN were assigned to me, beginning with the issue of January, 1913.

Personal Investigations

Experimental studies in genetics have occupied much of my time, especially during the summer months.

Several cultivated varieties of *Cichorium Intybus* were grown for the purpose of comparison with the common wild strains. F_1 generations of crosses between white-

flowered and blue-flowered plants, the latter both wild and cultivated, have been grown. The problems concerned with sterility have developed as an important phase of these investigations. Some statistical data were obtained regarding the variation in the numbers of flowers. The services of Mr. Gilman during his month of scholarship were an aid in these studies and throughout July and August Mr. Fraser assisted during the greater part of the forenoon in these studies. The studies of *Cichorium* will be pushed during the coming season as time and assistance will permit.

With *Verbascum Blattaria*, first generations of inbred lines of white and yellow races and of crosses between them were grown. Relatively few of the plants bloomed this year. It is hoped that hereafter the use of cold frames during the months of March and April will enable us to force a majority of plants into bloom in one season. During the coming year, I trust, definite data will be obtained on the problems for the treatment of which this plant seems favorable.

Progress can be reported in the studies of *Hibiscus*. Plants were grown from seed of types of *H. Moscheutos*, *H. oculiroseus* and *H. militaris*, and of various hybrid combinations. Very few of these plants matured to the age of blooming. It is my plan to continue and somewhat extend these investigations.

Observations on bud-variation in *Coleus Blumei* have been continued throughout the year. Several new types of color pattern have appeared. More intensive studies will be made of the frequency, character and stability of the variations. Morphological and cytological studies of the various types were made by Mr. E. G. Arzberger on a scholarship grant for the month of June. His interest in the problem led him to devote another month to the studies.

Some progress has been made in the breeding experiments with species of *Carex*. Preliminary experimentation has been made with several species not already mentioned to determine suitability for intensive study either by students or by myself.

Cytological studies have been pursued during the winter months as assiduously as time allows. I am anxious to complete several phases of cytological studies somewhat correlated with problems in heredity.

Students and Investigators

During the past year, all investigators formally registered in the records of the laboratory have been either recipients of Garden scholarships or candidates for advanced degrees at Columbia University. Several of the latter, however, have been tuition students of the Garden, doing a large part of their work under direction of members of the Garden staff. A number were primarily Columbia University students. The hearty cooperation of Professor R. A. Harper, Professor of Botany at Columbia University, has been of value in the consideration of various problems of student research. Professor William J. Gies has visited the Garden for consultation with students whose problems involve chemical investigations.

The degree of A.M. was granted by Columbia University during the year to Miss Katherine Reid and Miss Friedolina Jud, whose essays were based on investigations conducted at the Garden.

Student use of the facilities of the experimental garden and greenhouse has increased, especially as the particular problems progress. For these studies, considerable numbers of plants have been grown of *Hordeum*, *Tricitum*, *Secale*, *Althea rosea*, *Abutilon*, *Lupinus*, *Phlox*, and *Nicotiana*.

In the following list the more complete biographical data are given for *new students only*. In each case the problem here stated is the one under consideration at the Garden.

*Altenberg, Edgar. A.M., Columbia Univ., 11. Assistant in Botany, Columbia Univ.
Heredity of Althaea rosea and of various cereals.

†Andrews, Albert Le Roy. Ph.D., Kiel, 08. Instructor in Cornell Univ.
Taxonomy of the genus Bryum.

* Registered at Columbia.
† Research scholarship.

†Arzberger, Emil Godfred. A.B., Univ. of Wisconsin, 06; M.A., Washington University 10. Assistant in Botany, Univ. of Wisconsin, 06–09; Fellow at Shaw Bot. Garden, 09–10; Assistant Botanist, Ohio Experiment Station, 10–13; Pathologist, Bureau of Plant Industry, U. S. Dept. of Agric. 13–.

Cytological studies of variegation in Coleus.

*Burr, Freeman Foster. B.S., Harvard Univ., 00; A.M., Columbia Univ., 13. Science Teacher in Chicago Latin School, 00–01; in Pomfret School, Conn., 01–02; in Natick High School, Mass., 03–04; in State Normal School, New Haven, Conn., 04–12. Lecturer in Geology at Barnard. College, 12–. Post graduate at Columbia Univ., 12–.

Palaeobotany.

*Cameron, Walter S. A.B., City College of New York, 95; A.M., Columbia Univ., 12. Instructor in biology in Eastern District High School, Brooklyn, 06–07; in Normal Training High School, 08–09; in Commercial High School, 09–12; in Wadleigh High School, 12–.

Mosaic disease of tobacco.

Clark, Ernest Dunbar. Ph.D., Columbia Univ., 10. Chemist in Bureau of Chemistry, U. S. Dept. of Agriculture since September, 1913.

Problems in plant chemistry.

*Fraser, Allen Cameron. B.S., Cornell Univ., 13. Assistant in plant breeding, Cornell Univ., 12–13; Assistant in plant breeding, N. Y. Botanical Garden, summer of 1913; Assistant in botany and horticulture, Columbia Univ., 13–.

Heredity in Phaseolus and Aquilegia.

*Fromme, Fred D. B.S., South Dak. State College, 11. Assistant in Botany, Purdue Univ., since September, 1913.

Mycology; parasitic fungi.

†Gilman, Joseph Charles. B.S.A., Univ. of Wisconsin, 12. Assistant in Plant pathology, Univ. of Wisconsin, 11–.

Genetics. Statistical studies of flowers in Cichorium.

†Gleason, Henry Allan. Ph.D., Columbia Univ., 06. Assistant professor of Botany, Univ. of Michigan, 10–.

North American species of Vernonieae.

* Registered at Columbia.

† Research Scholarship.

JUD, FRIEDOLINA CATHARINA. B.S., Barnard College, 12; M.A., Columbia Univ., 13.

Palaeobotany. Geology.

KELLY, JAMES P. B.S., City College, N. Y., 06. Teacher in public schools, New York City.

Genetics: heredity in Phlox.

*KENNERLY, MARTHA MASON. B.S., Adelphi College, 03. Instructor in Biology, Normal College High School.

Morphology and Taxonomy of Bryales.

*LORD, MARY ELIZABETH. A.B., Columbia Univ., 07. Research at Cornell Summer School, 08; at Columbia Univ., 11–. Teacher in New York City schools 04–06; of biology in Normal College High School 07–.

The significance of fertilization in Lupinus hirsutus.

†MILLER, FRED A. B.S., 08, and M.S., 13, at Purdue University. Botanist with Eli Lilly & Company, Indianapolis, Ind.

The genus Digitalis.

NELSON, EDGAR. A.B., Cornell Univ., 12. Assistant in New York State Conservation Commission, summer of 1912; expert with Penn. Chestnut-tree Blight Commission, Oct. 12 to Jan. 1913; assistant in laboratories at Cold Spring Harbor, Jan. to July, 1913.

Pathology.

*MOOK, CHARLES C. B.S., Columbia Univ., 12. Assistant in Geology, Summer session, Columbia Univ., 12; Research Assistant in vertebrate palaeontology, American Museum of Nat. Hist. 12–.

Palaeobotany.

†PENNINGTON, LEIGH H. Ph.D., Univ. of Michigan, 09. Associate Professor of Botany at Syracuse Univ.

The genus Marasmius.

*RAEDER, RUTH WEIR. A.M., Wellesley College, 11. Research at Columbia Univ., 12–. Assistant in Geology, Wellesley College, 08–11; Assistant in Geology at Barnard College, 12–.

Palaeobotany.

REID, KATHERINE WILLESS. A.M., Columbia Univ., 13. Research student.

Physiology, genetics. Variegation in Abutilon and Ligustrum.

* Registered at Columbia.

† Research Scholarship.

*Umaceny, Lillie Anna. A.B., Normal College, 07. Research at Columbia Univ., 07–. Teacher in public schools, New York City, 07–.

Relation of the shape of cells to the shape of the organ.

*†Wilson, Guy West. M.S., Purdue Univ., 06. Special agent, U. S. Bureau of Plant Industry, 13–.

Biologic species of Phytophora. Investigations of the chestnut canker.

Besides the above named, a number of investigators have utilized various facilities for research at the Garden. Mention of these has been made from time to time in the Notes, News and Comment column of the Journal.

Respectfully submitted,

A. B. Stout,
Director of the Laboratories.

REPORT OF THE BIBLIOGRAPHER

Dr. N. L. Britton, Director-in-Chief.

Sir: I have the honor to submit the following report for the year 1913.

Upon the establishment of the position of Bibliographer in January, 1913, and my appointment to fill it, I was informed that my duties were: (1) to assist persons seeking botanical information to be found in books; (2) to make recommendations for the purchase of books; (3) to continue editorial and bibliographic work contingent upon the publication of North American Flora.

Scarcely a day has passed without calls for assistance in the tracking of information believed to exist somewhere in the Garden library. A partial record indicates that probably about a thousand such calls have been responded to during the year. The number, however, gives little idea of the amount of work involved, for in some cases the time consumed was less than five minutes, while occasionally a single problem would require an hour or more. Whatever time has been devoted to this service by the bibliographer,

*Registered at Columbia.

it gives him no little satisfaction to feel that he has thereby saved much more of the time of others. Official correspondence upon bibliographic questions also deserves mention, although it has not been large.

Recommendations for the purchase of books have scarcely occupied the bibliographer's attention at all during the year, for the reason that the funds available for such purchases have been very limited. It is to be hoped that the condition here referred to may be speedily remedied.

Three parts of NORTH AMERICAN FLORA have appeared during the year: Volume 15, Part 1, in June; Volume 15, Part 2, in August; and Volume 22, Part 5, in December. The two parts of volume 15, being the first portion of the Flora to deal with mosses, presented certain editorial and bibliographic problems not met with in the case of previous parts. Part 5 of volume 22, continuing the Rosaceae, was comparatively simple, yet the quantity of bibliographic and editorial work contingent upon the publication of 92 pages of this character is not easily comprehended by one who has not undertaken it, and tried to do it well.

Other work, outside of regular duties, has been continued during the year at such times as could be spared from daily routine. The bibliographer prepared for the January number of the JOURNAL of the Garden a "Catalogue of the Cox Collection of Darwiniana," and for the December number of the Bulletin of the Charleston Museum a biographical sketch of the late Dr. Otto Kuntze. He also contributed the account of the family Lentibulariaceae to the second edition of Britton and Brown's "Illustrated Flora," and the corresponding group, there called Pinguiculaceae, to Small's "Flora of Miami," "Flora of the Florida keys," and "Flora of Lancaster County," all published during the year.

Respectfully submitted,

JOHN HENDLEY BARNHART,

Bibliographer.

REPORT OF THE LIBRARIAN

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1913.

The position of Librarian at the New York Botanical Garden was assumed by me in January, 1913.

During the spring months, the work of moving and rearranging the books was carried on, those comprising the divisions of Horticulture, Forestry, Landscape Gardening and the publications of the U. S. Department of Agriculture (in part) being removed to the new stacks in the room to the west of the reading room. This has greatly relieved the congestion which prevailed in certain parts of the library.

The Cox collection of Darwiniana referred to in the JOURNAL for January, 1913, and in the BULLETIN for March of the same year has been installed in its specially constructed case which stands in the rear of the reading room. The cards for the books have been written and placed in the catalogue. Such cards bear the words "Cox Collection" in place of the usual call number.

Five framed portraits of botanists, the gift of Professor H. F. Osborne, have been presented to the library the past year, while the appearance of the other pictures has been greatly improved by remounting and by the regilding of the frames. This was done through the kindness of Mrs. Britton.

During the year, 949 volumes have been bound, including 31 which are the property of Columbia University.

The accessions, including 52 gifts, have been printed in the JOURNAL as usual: 24 books have been deposited by Columbia.

The census taken at the end of the year shows 25,376 bound volumes, a net gain of 1,352 over the census of a year ago.

2,111 written cards have been added to the catalogue, while the cards issued by the Torrey Botanical Club have been written up nearly to date and also entered.

The following publications should be added to the list of periodicals received regularly by the Garden which appeared in the BULLETIN (7: 325–347) and was supplemented in later reports (BULLETIN 8: 45 and 8: 213).

Amani. Biologisch-Landwirtschaftliches Institut, Hafen Tanga, Deutsch-Ost-Afrika. *Der Pflanzer* (replacing *Berichte*).
Bergen's Museum, Bergen, Norway. *Aarbog.*
Broteria: Revista Luso-Brazileira, Tuy, Spain.
Durham. University of Durham Philosophical Society, Newcastle-upon-Tyne, England. *Proceedings.*
Irish Gardening, Dublin, Ireland.
Louisiana State Museum, New Orleans, La. *Biennial Report.*
Philippine Agriculturist and Forester, Los Baños, Philippine Islands.
Saragossa. Asociación de Labradores de Zaragosa, Saragossa, Spain. *Boletin.*
Tree Talk, Stamford, Connecticut.

Omit the following:

Fern Bulletin.

Change the following:

Costa Rica. Sociedad Nacional de Agricultura, San José de Costa Rica. *Boletin*, to
Costa Rica. Ministerio de Fomento. San José de Costa Rica. *Boletin de Fomento.*
Harlem. Kolonial Museum te Haarlem, Haarlem, Holland. *Bulletin*, to
Amsterdam. Koloniaal Instituut, Amsterdam, Holland. *Jaarverslag.*

Respectfully submitted,

SARAH H. HARLOW,
Librarian.

REPORT OF THE SUPERINTENDENT OF BUILDINGS AND GROUNDS

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1913.

Regulating and Grading

Much of this work has been done in different parts of the Garden. Both sides of the 200th Street entrance have been graded and sodded and a guard rail 3 rails high has been erected from the piers to the railroad bridge.

Considerable grading and planting has been done on the north side of Lake no. 3. On the north side of Woodlawn Road Bridge, a retaining wall was built and the bank filled in and graded.

About 5,000 cubic yards of earth have been carted into the Garden by contractors in the neighborhood, who were looking for a convenient place to dispose of it. This earth was used to fill in the low land north of Woodlawn Road Bridge and was placed there at the expense of the contractors. A distance of 100 × 200 feet and about 18 inches deep has been graded on the east side of the Bronx River south of the Chestnut Bridge.

Both sides of the road leading to Bleecker Street entrance were regraded and planted. After the completion of the boundary fence along the Bronx Boulevard, a sodded grass gutter 500 feet long was constructed along the highest part of the wall to protect the foundations from heavy rains.

We removed 419 loads of stone, 773 loads of top soil, and 260 loads of earth. This stone was used to build paths, but principally on the path leading to conservatory range no. 1 from the museum building.

Drainage

We have built one catch-basin at the Bleecker Street entrance, connecting with the line of drainage running north, and another 325 feet long on the east boundary line south of the Propagating Houses.

Paths

Under the arbor on the west border of the Hemlock Grove, a path 6 feet wide and 300 feet long was constructed. A branch path 10 feet wide and 345 feet long was built through the Pinetum from conservatory range no. 1 to the museum building. A path 617 feet long was constructed and partly paved from the east entrance of conservatory range no. 1 through the Pinetum to the cross road in front of the museum building.

Running south from the Chestnut Bridge, on the east side of the Bronx River, a path 588 feet long is near completion.

All paths around conservatory range no. 1 and the path leading to the Elevated Approach were resurfaced with screening. We surfaced and screened 1,580 feet of path on the east side of the new road at the east side of the grounds, and spread 230 feet of trap rock on the lower end of this road.

Buildings

A new model telephone monitor with two extensions for outside communication has been installed in the museum building. This monitor will also serve for communication throughout the museum building. Repairs were made on the roofs of power house no. 1, the stable, and the museum building. The leaders of the museum building also were repaired. The rear and parts of side walls in the library and four window panels in the cryptogamic laboratory were re-plastered, and the terra cotta work of the rear cornice of the museum building was repointed.

In addition to repairs in and around grounds and buildings, the carpenters have constructed a closet and two sets of shelving in the publication room, 14 feet wide and 16 feet long, a closet for the storeroom, and another for power house no. 1. They also built a cabinet for parcels post, a cabinet for the Cox Collection of Darwiniana, and a telephone booth for the top floor of the museum building. All the windows on the top floor of the museum building have been weather-stripped. The west end of the rotunda on the west side

of the first floor of the museum building and the exterior of conservatory range no. 1 down to the gutters have been painted. In addition to this and other painting done around the grounds, all broken glass has been replaced throughout the conservatories by the painter.

On the northwest side of the museum building in the basement, a 50-foot steam trench was widened to the width of four feet and covered with iron plates, set evenly with floor, so as to enable steam fitters to make repairs on pipes.

One horse was purchased. The expenditures for lawn mowers, one horse, feeding and shoeing of horses, and repairs to wagons were $1,140.25.

Grounds

With the exception of the months of June, July, August and September, we have had one city officer to protect our grounds. On Sundays and holidays during these months, we have had two additional officers who patroled the grounds in the afternoons and evenings. We had had two regular keepers and eleven additional guards on Sundays and holidays. The average number of visitors during the warm months on Sundays and holidays was about 25,000, with the exception of the month of July, when this number was almost doubled. Owing to the vigilance of the employees, who kept the visitors to the paths and trails, there was little damage done to the lawns and plantations this season.

Two beds 8 feet wide and 193 feet long were subsoiled to a depth of 3 feet ready for planting in front of conservatory range no. 1. A boundary fence about 2,000 feet long has been erected along the Bronx Boulevard and the pergola on the east side of the Herbaceous Grounds has been completed. A new fire hydrant was set up on the driveway on the west side of the museum building. The water supply for the fountain in front of the museum building has been repaired. Two large cold frames 7 feet wide and 30 feet long have been built for the experimental enclosure at the Propagating Houses. The experimental garden has been increased about one half an acre.

Considerable work has been accomplished towards the uprooting of poison ivy throughout the grounds, which work will be continued until the ivy is exterminated.

Thirty-five tons of hay were mowed and stacked for the use of our horses this year. By running the gasoline engine for ten days, five months' supply of wood fuel for the Propagating Houses was cut.

Respectfully submitted,

ARTHUR J. CORBETT,

Superintendent of Buildings and Grounds.

SCHEDULE OF EXPENDITURES DURING THE YEAR 1913

1. CITY MAINTENANCE ACCOUNT

	Appropriated including Transfers		*Expended*		*Balances*
Salaries, Regular Employees	$76,929.75		$76,893.44		
Wages, Temporary Employees	6,880.25		6,880.25		
Total, Personal Service		$83,810.00		$83,773.69	$ 36.31
Forage Supplies	$ 635.00		$ 634.65		.35
Fuel Supplies	11,400.00		11,225.67		174.33
Office Supplies	320.00		320.00		
General Plant Supplies	200.00		180.50		19.50
Motorless Vehicles and Equipment	50.00		26.25		23.75
General Plant Equipment	3,275.00		3,275.00		
General Plant Materials	1,575.00		1,569.83		5.17
General Repairs	2,200.00		2,191.72		8.28
Expressage and Deliveries	135.00		134.96		.04
Telephone Service	125.00		114.80		10.20
General Plant Service	175.00		175.00		
Total, Sundry Expenses	$ 20,090.00		$ 19,848.38		
Total, City Maintenance Account	103,900.00		103,622.07	$277.93	

2. CONSTRUCTION AND EQUIPMENT ACCOUNT

	Balances January 9, 1913	*Balances and Appropriated*	*Expended*	*Balances*
	1910 Account			
Pipe for Connecting Drains	$ 1.71	$ 1.71		
Erection of Greenhouses and Connecting passages	.66	.66		
	1911 Account			
Construction of a Boundary Fence	108.52	108.52		
New Walks and Railings along Walks	.47	.47		
Masonry Retaining Walls and Steps, Power House	17.83	17.83		
Erection of a Pergola	309.85	309.85		
New Cases for Museum Building	203.23	203.23		
Erection of an Additional Greenhouse	620.11	500.00	$120.11	
	Appropriated			
	1913 Account			
Retaining Walls, Woodlawn Avenue Bridge	500.00	421.66	78.34	
Totals	$1,762.38	$1,563.93	$198.45	

3. SPECIAL GARDEN ACCOUNTS

	Subscriptions	*Sales and Refunds*	*Total*	*Expended*	*Balances*
Exploration Fund					
1901 to 1912	$37,028.45	$1,651.61	$38,680.06	$38,673.46	
1913		17.45	17.45		
Totals	37,028.45	1,669.06	38,697.51	38,673.46	$ 24.05
Museum and Herbarium Fund					
1901 to 1912	11,885.00	387.89	12,272.89	12,263.99	
1913				50.72	
Totals	11,885.00	387.89	12,272.89	12,314.71	*41.82
Plant Fund (Conservatory Fund)					
1900 to 1912	6,376.55	497.96	6,874.51	6,854.45	
1913	1,950.00	64.00	2,014.00	1,715.21	
Totals	8,326.55	561.96	8,888.51	8,569.66	318.85
Special Book Fund					
1899 to 1912	27,722.88	121.48	27,844.36	27.654.48	
1913				177.88	
Totals	27,722.88	121.48	27.844,36	27,832.36	12.00
*Shortage					
Summary of Special Garden Accounts					
1899 to 1912	83,012.88	2,658.94	85,671.82	85,446.38	
1913	1,950.00	64.00	2,031.45	1,943.81	
Totals	84,962.88	2,722.94	87,703.27	87,390.19	313.08

4. CHARLES FINNEY COX MEMORIAL FUND

1912	5,075.00		5,075.00	1,500.00	
1913				3,568.10	
Totals	5,075.00		5,075.00	5,068.10	6.90

5. GARDEN ACCOUNTS

A. SPECIAL INCOME

	Appropriated including Transfers	*Expended*	*Balances*
Income of Lydig Fund			
Publications	$4,000.00	$4.106.65	*$106.65
Income of Mills Fund			
Horticultural Prizes	$435.00	$432.00	3.00
Investigations at other Institutions	790.00	822.60	* 32.60

Lectures and Lantern Slides	725.00		730.30	* 5.30
Photography.....	400.00		380.95	19.05
Research Scholarships....	150.00		150.00	
Totals.....		2,500.00		2,515.85
Net Shortage, Income of Mills Fund.....				* 15.85
Income of Stokes Fund Preservation of Native Plants.....	400.00		329.60	70.40
Income of Students Research Fund				
Aid for Students Research	200.00		200.00	
Income of Science and Education Fund.....	1,500.00		1,446.52	53.48
Totals, Special Income.	8,600.00		8,598.62	1.38

*Shortage

B. GENERAL INCOME

	Appropriated including Transfers		*Expended*	*Balances*
Assistance for Treasurer....$	420.00	$	420.00	
Circulars for Membership...	440.00		436.96	$ 3.04
Contingent Fund.....	945.00		942.78	2.22
Exploration Expenses.....	660.00		659.30	.70
Insurance.....	640.00		636.35	3.65
Laboratories.....	880.00		854.22	25.78
Museums and Herbarium...	715.00		679.31	35.69
Supplies, Museum and Library.....	1,510.00		1,450.33	59.67
General Supplies.....	820.00		817.18	2.82
Special Assistance.....	450.00		226.94	223.06
Labor.....	1,940.00		1,935.39	4.61
Salaries.....	14,100.00		13,557.50	542.50
Totals.....		$23,520.00		$22,616.26 903.74
Summary, Garden Accounts.				
a. Special Income.....	8,600.00		8,598.62	1.38
b. General Income.....	23,520.00		22,616.26	903.74
Totals.....		32,120.00		31,214.88 905.12

6. SUNDRIES—SPECIAL

Repairs made to the floor of Platform approach to the Bronx Park Station.	
Paid to Robert R. Fox, Contractor.....	$ 375.00
Repaid by Interborough Rapid Transit Co.....	375.00

7. SUNDRIES—MISCELLANEOUS

Books.....	2,693.27

8. EXPENDED FROM FUNDS OF THE GARDEN

	Expended	
Special Garden Accounts for 1913.....	$ 1,943.81	
Charles Finney Cox, Memorial Fund for 1913.....	3,568.10	
Garden Accounts.....	31,214.88	
Sundries—Special.....	375.00	
Sundries—Miscellaneous.....	2,693.27	
Total.....		$39,795.06

Respectfully submitted,

WALTER S. GROESBECK,

Accountant.

E. and O. E.

New York, January 10, 1914.

REPORT OF THE CHAIRMAN OF THE SCIENTIFIC DIRECTORS

To the Board of Managers of the New York Botanical Garden.

Gentlemen: I have the honor to submit the following report from the Scientific Directors for the year 1913.

The loss sustained by the death of our former President, Judge Brown, has been felt by the Scientific Directors with special force. Being an active worker in botanical science, as well as the executive head of the Garden, Judge Brown's relations with us were somewhat closer than is usually the case with a presiding officer and we miss keenly his participation in our deliberations.

Several changes in the Garden staff have occurred during the year. Through the appointment of Dr. Hollick as Curator-in-Chief of the Staten Island Association of Arts and Sciences, we have lost his services as Curator of our collections in paleobotany. For the present, at least, his work will be performed by the museum aid in that division. Our regret at this loss is somewhat tempered by the knowledge that Dr. Hollick will continue to serve us in an advisory capacity as Honorary Curator. The following resolutions with reference to his retirement were adopted by the Scientific Directors at their meeting of December 13.

Resolved: that the Scientific Directors of the New York Botanical Garden regret the withdrawal of Dr. Arthur Hollick from the curatorial staff. His services as a Curator have extended over 13 years, during which period he has discharged the duties of his position with enthusiasm and ability; his investigations and published contributions to science have been noteworthy, and highly creditable to himself and to the Garden.

Resolved: That the Scientific Directors wish Dr. Hollick all success in his new position of usefulness, in the development of the museum of the Staten Island Association of Arts and Sciences and in the expansion of the scientific and educational work of that institution.

Resolved: That subject to the approval of the Trustees of the Staten Island Association of Arts and Sciences, the Board of Managers of the New York Botanical Garden be requested to designate Dr. Hollick Honorary Curator of the Collection of Fossil Plants.

Resolved: That the Director-in-Chief be and he is hereby authorized to loan the Staten Island Association of Arts and Sciences, from time to time, such specimens of fossil plants of the Garden collection as Dr. Hollick may wish to study in continuation of his investigations.

In my last annual report, mention was made of the establishment of the new grade of Associate Curator, the object being to provide for the promotion of such assistant curators as may be entitled to a higher rank, but for whom curatorships are not available. At our last meeting, it was resolved to recommend to your Board that Mr. Percy Wilson be thus promoted.

The scientific work of the Garden during the past year has been markedly active and efficient. This is especially true of authorship and publication, in which are included the works of the members of the staff published otherwise than by the Garden itself. The publications of the Garden include complete volumes of the BULLETIN, JOURNAL and MYCOLOGIA, the latter containing descriptions of nearly a hundred new species by Dr. Murrill, and three parts of the NORTH AMERICAN FLORA. Outside publications by members of our staff are the second edition of Britton and Brown's "Illustrated Flora," the second edition of Dr. Small's "Flora of the Southeastern United States," and four descriptive works on Florida plants by Dr. Small. An elaborate work on the Rocky Mountain flora has been completed by Dr. Rydberg in connection with his work in the classification of our collections, but no way of publishing it has yet been found.

Work on the preparation of the manuscript of our Guide, not only to the buildings and grounds, but to the plants, has progressed satisfactorily. The same is true of the work

on our local flora by Mr. Norman Taylor, a work likely to prove of exceptional interest and value among local floras. Besides these complete works, many papers have been contributed in the publications of the Torrey Botanical Club and elsewhere.

The most important exploration of the year was one of some three months' duration, made in the West Indies by our Director-in-Chief, accompanied by Mrs. Britton and Mr. J. A. Shafer. Dr. Britton, accompanied by Mr. Stewardson Brown, also spent some time in Bermuda. These two expeditions were conducted with a view to closing up certain gaps which existed in our knowledge of the flora of the regions visited. For a similar purpose, Dr. Small made two visits to Florida.

In this connection, reference should be made to a visit of Dr. Murrill to European herbaria for studies necessary in the preparation of his portion of the NORTH AMERICAN FLORA.

Laboratory and culture work by and under the direction of Dr. Stout has been in the general direction of heredity and variation in plants, and has been very actively pursued. Special studies have been made in bud-variation, as illustrated in *Coleus*, biotypes in *Hibiscus*, the influence of repeated crossings in *Verbascum*, and variations in inheritance in chicory.

Twenty-two students have pursued regular lines of work in the Laboratory. Although this work covers a variety of subjects, it has a strong general bearing on Dr. Stout's individual studies. The following are the more important of these subjects: Heredity in *Phaseolus*, *Aquilegia* and *Phlox*, fertilization in a lupine, the relation of the shapes of cells to that of the organ containing them, the mosaic disease of tobacco, the genera *Bryum*, *Marasmius*, *Digitalis*, and *Vernonia*, plant pathology and paleobotany. Mr. Gleason's paper on *Vernonia* is worthy of special mention. Not only does it contribute knowledge of many new species but it also places the general nature of this large and difficult genus before us in a better light.

Besides this work of our regular students, many visiting botanists have pursued their researches in our herbarium and library. Especially noteworthy is a visit by Dr. William Trelease, for the study of the genus *Phoradendron.*

In addition to this very general use of the herbarium by visitors, a great amount of service has been rendered in the naming of specimens sent in to us for that purpose. In the division of Fungi, the amount of such work has nearly doubled over that of the preceding year.

Some extensive and valuable exchanges of specimens have been arranged during this year.

Continued progress has been made in the control of the Hickory and Hemlock beetles, as well as of the Cactus fly.

Our relations with the work of other institutions have been cultivated and extended. In association with the New York Horticultural Society, the usual meetings and plant exhibitions have been held. The newly organized New York State Forestry Association has held a convention at the Garden and has been entertained by us. Delegates from or representatives of the Garden have attended the meetings of the New York Library Club, the American Association for the Advancement of Science, the National Park Superintendents' Convention, and the inauguration of Dr. Finley as State Commissioner of Education and President of the University of the State of New York. Close association has obtained with the Torrey Botanical Club and the Brooklyn Botanic Garden. Our relations with the herbarium of the National Museum have been peculiarly close, and mutually helpful, especially in connection with the study of Cactaceae, which work continues to be vigorously pursued by Dr. Britton and Dr. Rose.

Our public lecture courses have included thirty-five lectures, in addition to the spring course to the pupils of the public schools. Our fall course represented a new departure in our lecture division, in that it took up the various phases of a single subject, that of vegetable foods, presented in the form of a symposium. The result of this experiment

was a distinct success. Interest in the lectures and attendance upon them increased from the beginning. The publication of abstracts of these lectures in our JOURNAL, which has been decided upon, will still farther increase this interest and greatly extend the educational value of the work.

An important feature of the internal work of the Garden staff, which I think has never yet been brought to your attention, is the regular series of monthly conferences held at 4 P.M. on Wednesday afternoons in the Laboratory of the Museum Building. At these conferences, the several members of the staff and their students discuss the subjects to which they are respectively devoting their attention, so that the interest of all is maintained in the general progress and in the mutual relations of the different departments. The interest in and the value of these conferences have steadily increased and it has become a strong influence in promoting the integrity of our work. Doubtless many of the Managers, as well as the Scientific Directors, would be interested in attending these conferences.

Two minor matters, here worthy of mention, are the opportunity which has been afforded by the installation of our new museum cases for improving the display features of our economic collection, and the public value of the rose collection planted last spring near the eastern end of our southern glass house. This collection represents all the more important varieties of roses suitable for outdoor culture. They are all carefully and plainly labeled with their names, and thus afford a perfect opportunity for those intending to procure rose plants to make an intelligent selection of varieties.

Not the least important part of our work during one year is that of planning for that of the future, and this duty has received our careful and continuous attention. In the work of the coming year, exploration is to play an unusually important part. We have accepted an invitation to cooperate with the New York Academy of Sciences and the American Museum of Natural History in a scientific survey

of Porto Rico. Our own portion of the preliminary work of such a survey has been largely performed already by the several expeditions which we have sent to that island. Several localities upon and near it, however, still remain to be visited, and we have arranged for such visits during 1914 by the Director-in-Chief and Dr. J. A. Shafer. For a similar purpose, the Director-in-Chief will also make a short visit to Bermuda. The most important exploration of the year will be one to the West Andean region by Dr. Shafer, for the purpose of collecting living Cactaceae, not only to complete our collections, but also to supply material for study and illustration in the preparation of the proposed monograph of that family. The expense of this work will be shared by the Carnegie Institution. There are probably two hundred or more species of cactuses growing in the Andes which are not represented in our collection, and we are hoping much from the results of this expedition.

Arrangements have been made for cooperating with the newly formed School of Agriculture of Columbia University. A portion of land which is not needed in our own cultural operations is to be used by that school for experiment and instruction.

The director of our laboratories, Dr. Stout, has been assigned to duty in Europe for a period of six weeks, to pursue special studies in relation to the subjects already mentioned as having occupied him during the past year.

The most important subject that is now engaging our attention is that of providing for that extension of our work which is inevitable in the early future. We have already outgrown the capacity of our present Museum Building. At one time during 1912, we were strongly inclined to encroach upon the museum floors for needed laboratory space, and we avoided this contingency only by a temporary expedient that has been found decidedly inconvenient in our scientific work. Our necessities in this direction have since grown and we feel that we must very shortly resort to the undesirable method which I have mentioned. Such an

arrangement should under no circumstances be allowed to become permanent, or to continue long in operation. To avoid this, there is but one course open to us, namely, that of the erection of an additional portion of the Museum Building, as planned, and it will be necessary during the coming year to direct your attention definitely to this need.

The necessity for larger grounds to accommodate our broadening work is also certain to engage our attention in the not distant future more definitely than it has already done.

Respectfully submitted,

H. H. RUSBY,

Chairman.

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS FOR THE YEAR 1913

To the Board of Managers of the New York Botanical Garden.

Gentlemen: The number of new members who have qualified is 66. The number of annual members is now 829; life members 153; sustaining members 17; fellowship members 7.

Of these 38 are now in arrears for dues for 1913; 8 are now in arrears for dues for 1912 and 1913, 6 are in arrears for dues for 1911, 1912, and 1913.

Dues have been collected to the amount of $9155.

Twelve persons have qualified as patrons by the payment of $5,000 each, 22 as fellows for life by the payment of $1,000 each, 3 as life members by the payment of $250 each.

These sums have been transmitted to the Treasurer.

A complete list of all classes of members to date is herewith submitted.

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Miss Helena Flint,
F. S. Flower,
Miss Mary A. Flower,
Edward H. Floyd-Jones,
Franz Fohr,
Chas. J. Follmer,
James D. Foot,
Scott Foster,

Werner V. Frankenburg,
Miss Jane K. Fraser,
Miss S. Grace Fraser,
Dr. J. J. Friedrich,
A. S. Frissell,
John W. Frothingham,
E. A. Funke,
Miss Clementina Furniss,
W. F. Gade,
Albert Gallatin,
Geo. F. Gantz,
Joseph E. Gay,
Mrs. Walter Geer,
John J. Gibbons,
R. W. Gibson,
J. Waldron Gillespie,
Mrs. S. D. Godfrey,
Chas. Gotthelf,
Paul Gottheil,
Chas. A. Gould,
Edwin Gould,
Robert D. Graham,
G. C. Graves,
Nelson Z. Graves,
Hon. John Clinton Gray,
Rev. David H. Greer,
Miss Susan D. Griffith,
E. Morgan Grinnell,
Henry W. Guernsey,
William Guggenheim,
A. M. Guinzburg,
Miss Delia L. Gurnee,
W. S. Gurnee, Jr.,
Mrs. Gurnee,
John A. Hadden, Jr.,
J. and M. Haffen,
Daniel S. Hage,
William Hague,
Hon. Ernest Hall,
Wm. Halls, Jr.

Miss Laura P. Halsted,
Wm. Hamann,
Miss Katherine L. Hamersley,
L. Gordon Hamersley,
Miss Adelaide Hamilton,
Miss Elizabeth S. Hamilton,
Chas. T. Harbeck,
Anson W. Hard,
J. Montgomery Hare,
E. S. Harkness,
Mrs. Frank D. Harmon,
S. W. Harriot,
William Hamilton Harris,
Jacob Hasslacher,
J. C. Havemeyer,
T. A. Havemeyer,
J. Woodward Haven,
Matthew Hawe,
Miss Caroline C. Haynes,
Mrs. W. R. Hearst,
Wm. W. Heaton,
Julius Heimann,
Hancke Hencken,
Chas. Henderson,
Mrs. E. C. Henderson,
Harmon W. Hendricks,
Mrs. A. Barton Hepburn
B. F. Hermann,
Ferdinand Hermann,
Selmar Hess,
H. H. Hewitt,
Mrs. Sarah A. Hewitt,
Walter Hinchman,
Chas. S. Hirsch,
J. Oakley Hobby,
B. Hochschild,
Mrs. H. P. Hodson,
Richard M. Hoe,
Mrs. Richard March Hoe,
Mrs. Robert Hoe,
Bernhard Hoffman,
Mrs. Edward Holbrook,
John Swift Holbrook,
E. R. Holden,
Henry Holt,
F. T. Hopkins,
William B. Hornblower,
Frederick B. House,
C. J. Housman,
M. D. Howell,
John Sherman Hoyt,
Theodore R. Hoyt,
Walter C. Hubbard,
Conrad Hubert,
Alex C. Humphreys,
Mrs. E. W. Humphreys,
Mrs. C. P. Huntington,
Adolph G. Hupfel,
Dr. Frank Hustace,
Karl Hutter,
Frank DeK. Huyler,
Henry St. John Hyde,
Adrien Iselin, Jr.,
C. Oliver Iselin,
Miss Georgine Iselin,
William E. Iselin,
Mrs. William E. Iselin,
Miss Flora E. Isham,
Samuel Isham,
Wm. M. Ivins,
Dr. Abram Jacobi,
Samuel K. Jacobs,
John S. Jacobus,
A. C. James,
Dr. Robert C. James,
E. C. Jameson,
Alfred W. Jenkins,
O. G. Jennings,
Walter B. Jennings,
Mrs. Maria de W. Jesup,

Dwight A. Jones,
Mrs. Townsend Jones,
Karl Jungbluth,
Jos. L. Kahle,
Louis Kahn,
Mrs. Delancey Kane,
Miss Louise Landgon Kane,
Mrs. H. F. Kean,
Frank Browne Keech,
Henry F. Keil,
Prof. J. F. Kemp,
Mrs. John S. Kennedy,
David Keppel,
Rudolph Keppler,
Mrs. Catherine L. Kernochan,
John B. Kerr,
Geo. A. Kessler,
Patrick Kiernan,
S. E. Kilner,
Alfred R. Kimball,
David H. King, Jr.,
Le Roy King,
Mrs. Wm. M. Kingsland,
W. Ruloff Kip,
E. C. Klipstein,
Roland F. Knoedler,
Chas. Kohlman,
Louis Krower,
H. C. Kudlick,
Adolf Kuttroff,
Francis G. Landon,
Edward V. Z. Lane,
Woodbury Langdon,
J. Langeloth,
Dr. G. Langmann,
Mrs. John J. Lapham,
Lewis H. Lapham,
F. F. Lathrop,
Mrs. Lauterbach,
John Burling Lawrence,
Mrs. Samuel Lawrence,
Prof. Frederic S. Lee,
Mrs. Frederic S. Lee,
Marshall C. Lefferts,
Wm. H. Lefferts,
James M. Lehmaier,
Edward A. Le Roy, Jr.,
Arthur L. Lesher,
Dr. A. Monae Lesser,
Wm. H. Leupp,
Enamuel Levy,
Adolph Lewisohn,
Miss Alice Lewisohn,
Julius A. Lewisohn,
Philip Lewisohn,
Paul Lichtenstein,
Lowell Lincoln,
Frederick J. Lisman,
Wm. S. Livingston,
Wm. C. Lobenstine,
Frank J. Logan,
Mrs. Geo. de Forest Lord,
P. Lorillard, Jr.,
Ethelbert I. Low,
Miss Carlotta R. Lowell,
August Lueder,
George Lueders,
Walther Luttgen,
Dr. D. H. McAlpin,
Geo. L. McAlpin,
John A. McKim,
Henry P. McKinney,
James McLean,
Clarence H. Mackay,
Kenneth K. Mackenzie,
Malcolm MacMartin,
George H. Macy,
V. Everit Macy,
F. Robert Mager,
J. H. Maghee,

Frank H. Main,
Pierre Mali,
Chas. Mallory,
J. A. Manda,
Miss Delia W. Marble,
John Markle,
Dr. J. W. Markoe,
Prof. W. C. Marquette,
C. P. Marsh,
Edwin S. Marston,
George Massey,
William J. Matheson,
Francis Taylor Maxwell,
Robert Maxwell,
David Mayer,
Harry Mayer,
Effingham Maynard,
B. Frank Mebane,
C. S. Mellen,
Manton B. Metcalfe,
Herman A. Metz,
Edwin O. Meyer,
George A. Meyer,
Harry J. Meyer,
John G. Milburn,
Dr. Geo. M. Miller,
S. M. Milliken,
Mrs. John Murray Mitchell,
Alphonse Montant,
Clement Moore,
Mrs. Clement C. Moore,
J. C. Moore,
Miss Anne Morgan,
Miss C. L. Morgan,
E. D. Morgan,
Mrs. J. P. Morgan,
Wm. Fellows Morgan,
W. Forbes Morgan, Jr.,
Mrs. Cora Morris,
Mrs. Dave Hennen Morris,
Henry Lewis Morris,
Dr. Louis R. Morris,
Geo. Austin Morrison,
Richard Mortimer,
Henry C. Mott,
Frank J. Muhlfeld,
Carl Muller,
John P. Munn,
Frank A. Munsey,
William S. Myers,
A. G. Nesbit,
Mrs. Russell H. Nevins,
Miss Catherine A. Newbold,
Miss Edith Newbold,
Frederic R. Newbold,
Hugo Newman,
Wm. Nilsson,
Adolph S. Ochs,
John Offerman,
P. M. Ohmeis,
E. E. Olcott,
Elam Ward Olney,
Robert Olyphant,
Mrs. Emerson Opdycke,
Wm. S. Opdyke,
Mrs. Wm. Openhym,
William C. Orr,
Mrs. William Church Osborn,
Prof. Henry F. Osborne,
Augustus G. Paine,
Henry Parish, Jr.,
Winthrop Parker,
James C. Parrish,
Chas. W. Parsons,
Mrs. Edwin Parsons,
John E. Parsons,
Mrs. Sarah J. Parsons,
R. W. Paterson,
W. A. Paton,
O. H. Payne,

Mrs. Frederick Pearson,
Edward S. Pegram,
Mrs. Sarah G. T. Pell,
Stephen H. P. Pell,
Edmund Penfold,
George E. Perkins,
Samuel T. Peters,
W. R. Peters,
Chas. Pfizer, Jr.,
Mrs. von R. Phelps,
Guy Phillips,
Henry Phipps,
Lloyd Phoenix,
Phillips Phoenix,
Gottfried Piel,
Michael Piel,
Henry Clay Pierce,
Winslow S. Pierce,
Mrs. R. Stuyvesant Pierrepont,
J. Fred Pierson,
Albert Plaut,
Gilbert M. Plympton,
Chas. Lane Poor,
Abram S. Post,
Miss Blanche Potter,
Frederick Potter,
John T. Pratt,
Miss Cornelia Prime,
Chas. Pryer,
Mrs. Kate Davis Pulitzer,
J. Harsen Purdy,
H. St. Clair Putnam,
Dr. L. Putzel,
Percy R. Pyne,
Charles F. Quincy,
Dr. Edward Quintard,
Charles Raht,
Edmund D. Randolph,
S. Rawitser,
G. B. Raymond,
Geo. R. Read,
Wm. A. Read,
Miss Emily Redmond,
Geraldyn Redmond,
John Reid,
Geo. N. Reinhardt,
Chas. Remsen,
Miss Serena Rhinelander
E. A. Richard,
Miss Elvine Richard,
Eben Richards,
Wm. J. Riker,
George L. Rives,
Dr. Wm. C. Rives,
Geo. I. Roberts,
Miss Mary M. Roberts,
Miss Jennette Robertson,
Julius Robertson,
Andrew J. Robinson,
William G. Rockefeller,
Alfred Roelker,
Edward L. Rogers,
A. J. Rolle,
W. Emlen Roosevelt,
Mrs. W. Emlen Roosevelt,
Hon. Elihu Root,
Basil W. Rowe,
Carman R. Runyon,
Jacob Ruppert,
Mrs. A. D. Russell,
John Barry Ryan,
Arthur Ryle,
Harry Sachs,
Paul J. Sachs,
Clarence Sackett,
Miss Lillian Bell Sage,
Mrs. Russell Sage,
Daniel C. Sands,
Miss G. W. Sargent,
Herbert L. Satterlee,

Mrs. Herbert L. Satterlee,
Carl Schefer,
Mrs. H. M. Schieffelin,
Dr. Wm. J. Schieffelin,
Rudolph E. Schirmer,
Miss Jane E. Schmelzel,
D. Schnakenberg,
Henrich Schniewind, Jr.,
C. M. Schwab,
Gustav Schwab, Jr.,
Robert J. F. Schwarzenbach,
Walter Scott,
Miss Grace Scoville,
Robert Scoville,
Edward M. Scudder,
Alonzo B. See,
Charles E. Seitz,
Prof. Edwin R. A. Seligman,
Jefferson Seligman,
E. W. Sells,
Mrs. Charles H. Senff,
Alfred Seton,
George R. Sheldon,
Wm. Shillaber,
Henry Siegel,
John W. Simpson,
Charles A. Singer,
Dr. Frank D. Skeel,
Francis Louis Slade,
Benson B. Sloan,
Samuel Sloan,
Mrs. Samuel Sloan,
Daniel Smiley,
Chas. F. Smillie,
Dr. A. Alexander Smith,
Miss Fanny A. Smith,
Frank Morse Smith,
F. M. Smith,
Pierre J. Smith,
R. A. C. Smith,
E. G. Snow,
E. G. Soltmann,
Mrs. Charlotte Sorchan,
Mrs. Edward W. Sparrow,
Mrs. Florence Colgate Speranza,
W. M. Sperry,
Paul N. Spofford,
Miss Anna Riker Spring,
J. R. Stanton,
James H. Stebbins,
James R. Steers,
Chas. H. Steinway,
Fred. T. Steinway,
Wm. R. Steinway,
Olin J. Stephens,
Benjamin Stern,
Sereno Stetson,
Alexander H. Stevens,
Frederic W. Stevens,
Dr. Geo. T. Stevens,
Lispenard Stewart,
Mrs. John Wood Stewart,
Wm. R. Stewart,
Miss Clara F. Stillman,
Dr. D. M. Stimson,
James Stokes,
Albert Strauss,
Chas. Strauss,
Frederick Strauss,
Samuel Strauss,
Mrs. Gustav Stromberg,
Mrs. Adeline Torrey Strong,
Benj. Strong, Jr.,
Joseph Stroock,
F. K. Sturgis,
Mrs. F. K. Sturgis,
Mrs. James Sullivan,
Miss Mary Taber,
Henry W. Taft,
Edward N. Tailer,

James Talcott,
Leon Tanenbaum,
C. A. Tatum,
Henry R. Taylor,
W. A. Taylor,
C. H. Tenney,
H. L. Terrell,
Jno. T. Terry,
Thomas Thacher,
Miss M. J. Thayer,
Mrs. Emily Jordan Thomas,
Seth E. Thomas, Jr.,
L. S. Thompson,
William B. Thompson,
Dr. W. Gilman Thompson,
Jonathan Thorne,
Samuel Thorne, Jr.,
W. V. S. Thorne,
Myles Tierney,
Louis C. Tiffany,
Henry N. Tifft,
James Timpson,
J. Kennedy Tod,
William Tousey,
C. D. Tows,
P. S. Trainor,
A. F. Troescher,
Frederick K. Trowbridge,
Dr. Alfred Tuckerman,
Paul Tuckerman,
Geo. E. Turnure,
Benjamin Tuska,
Mrs. Mary A. Tuttle,
E. S. Twining,
Mrs. Eliza L. D. Tysen,
Oswald W. Uhl,
E. S. Ullman,
Theodore N. Vail,
Mrs. Adelaide S. Van Brunt,
Alfred G. Vanderbilt,
D. B. Van Emburgh,
Barend Van Gerbig,
E. H. Van Ingen,
Edgar B. Van Winkle,
Hon. Robert A. Van Wyck,
Mrs. James M. Varnum,
Richard C. Veit,
Thos. F. Vietor,
Frank Vincent,
Herman Vogel,
Wm. I. Walter,
Artemus Ward,
Mrs. John Hobart Warren,
Mrs. John I. Waterbury,
Mrs. John J. Watson, Jr.,
Thomas L. Watt,
F. Egerton Webb,
Mrs. W. Seward Webb,
Chas. Wehrhane,
Camille Weidenfeld,
Charles H. Weigle,
Mrs. C. Gouveneur Weir,
Mrs. Samuel W. Weiss,
Mrs. John Wells,
Mrs. Robert E. Westcott,
Geo. Westinghouse,
Mrs. Alice T. Wheelock,
Dr. Wm. E. Wheelock,
Miss Caroline White,
Horace White,
John J. White, Jr.,
Clarence Whitman,
Miss Margaret S. Whitney,
Edward A. Wickes,
D. O. Wickham,
Mrs. I. T. Williams,
Mrs. Percy H. Williams,
Richard H. Williams,
W. P. Willis,
Charles T. Wills,

Prof. Edmund B. Wilson,
George T. Wilson,
Mrs. H. S. Wilson,
Miss Margaret B. Wilson,
Egerton Winthrop,
Grenville L. Winthrop,
Mrs. Robt. Winthrop,
Mrs. Frank S. Witherbee,
Dr. R. A. Witthaus,
Ernst G. W. Woerz,
S. Herbert Wolfe,
Emil Wolff,
Lewis S. Wolff,
William E. Wolff,
Mrs. Cynthia A. Wood,
Henry R. Wood,
Prof. R. S. Woodward,
Mrs. William Woodward, Sr.
W. H. Woolverton,
P. B. Worrall,
Miss Julia Wray,
Mrs. J. Hood Wright,
A. Wurzburger,
Mrs. A. Murray Young,
Edw. L. Young,
Andrew C. Zabriskie,
Mrs. Anna M. von Zedlitz,
Mrs. John E. Zimmermann,
August Zinsser,
Charles Zoller,
O. F. Zollikoffer.

REPORT OF THE TREASURER

NEW YORK, January 9, 1914.

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen: Herewith I submit a statement of my receipts and disbursements during the year 1913, and a balance sheet from my ledger as of December 31, 1913.

Respectfully yours,

JAMES A. SCRYMSER,
Treasurer.

RECEIPTS AND DISBURSEMENTS

Receipts

Balance as per last Annual Report		$ 11,261.98
Contributions of the City toward development and maintenance		91,723.40
Subscriptions to Endowment Fund for Science and Education		66,845.00
Legacy, Henry Iden		10,000.00
Donation from Mrs. John Innes Kane, for fund to be known as the John Innes Kane Fund		10,000.00
General Investment Account (Principal)		
Canada Southern Railway Co. Bonds, matured January 1, 1913.	$50,000.00	
Interborough Rapid Transit Bonds, redeemed November 12, 1913, at 105	52,500.00	102,500.00
Income from General Investments:		
Credited General Income Account:		
5 per cent. on $50,000 Southern Ry. Co. 1st Consolidated Mortgage Bonds	$ 2,500.00	
4½ per cent. on $50,000 Ches. & Ohio R. R. Co. General Mortgage Bonds	2,250.00	
4 per cent. on $50,000 Erie R. R. Co. Prior Lien Bonds	2,000.00	
4 per cent. on $59,000 Erie R. R. Co. Penn.-Coll. Trust Bonds	2,360.00	

4 per cent. on $50,000 Reading R. R. Co. Jersey Central Coll. Trust Bonds		2,000.00
4 per cent. on $24,000 Northern Pacific R. R. St. P. & D. Div. Bonds		960.00
4 per cent. on $30,000 Northern Pacific R. R. Gt. Nor.—C. B. & Q. Coll. Trust Bonds	1,200.00	
4 per cent. on $10,000 New York City 4 per cent. Stock of 1959	400.00	13,670.00
Income from other Investments:		
Credited Income D. O. Mills Fund, 5 per cent. on $50,000 Interborough Rapid Transit Bonds		2,500.00
Credited Income Science and Educational Fund, 4½ per cent. on $10,000 New York Central Lines Equipment Notes (1 year)		450.00
5 per cent. on $10,000 Louisville and Nashville Equipment Notes (6 months)		250.00
Annual Dues		7,880.00
Life Membership Fees		500.00
Fellowship Members' Fees		800.00
Sustaining Members' Fees		475.00
Interest at 3 per cent. on balances with J. P. Morgan and Co.		
General fund	$ 139.40	
Income Science and Education fund	288.12	
Income John Innes Kane fund	6.66	434.18
Subscriptions to "North American Flora," sales of Publications, etc., credited income of David Lydig Fund		2,062.59
Contributions, etc., to Plant Fund		2,014.00
Contributions, etc., to Exploration Fund		17.45
Contributions, etc., to Students' Research Fund		247.50
Sundry Refunds, on account of travel		32.50
Proceeds Sales of Merchandise		64.30
Total Receipts		$323,727.90

Disbursements

General Investment Account,		
Purchase (Jan. 15, 1913) $50,000. Interborough Rapid Transit Bonds (5 per cent.), at 104⅝....	$52,375.00	
Investment of D. O. Mills Fund:		
Purchase (Nov. 14, 1913) $53,000. Grand Trunk Railway Equipment Notes, 4½ per cent. $18,000 maturing May, 1922, $35,000 maturing May, 1923...	$50,015.63	
Investment of Science and Education Fund:		
Purchase (June 2, 1913) $10,000 Louisville and Nashville Equipment Bonds, 5 per cent.....	$10,000.00	
Purchase (May 17, 1913) $10,000 New York Central Lines Equipment Trust 1913.....	$ 9,510.48	$19,510.48
Investment of Henry Iden Fund:		
Purchase (Oct. 21, 1913) $11,000 Milwaukee, Sparta, and N. W. R. R. Co Bonds (4 per cent.)...		10,120.00
Income of Henry Iden Fund:		
Commission on investment and interest Oct. 1–21.		74.87
Income of D. O. Mills Fund, and interest.		602.52
Income of Science and Education Fund:		
Commission on investment and interest.....		186.39
Expenses paid through Director-in-Chief:		
Account of City Appropriations..		91,723.40
On general account for vouchers paid..		19,782.55
Special Book Fund for books.....		409.54
Plant Fund for purchase of Plants		1,062,98
Exploration Fund, for specimens, etc.....		1.75

Museum and Herbarium Fund, for purchases, etc....	85.46	
Income of Students' Research Fund for Grants.....	200.00	
Income of David Lydig Fund for Publications.	1,829.25	
Income of D. O. Mills Fund for Sundries.	3,170.74	
Income of Stokes Fund for Printing...	300.00	
Income of Science and Education Fund.....	1,063.48	
On Account of Charles Finney Cox Memorial Fund.....	4,568.10	257,082.14
Balance, cash in hands of Treasurer		$ 66,645.76

Ledger Balances, December 31, 1913

Credit

Permanent Funds

Endowment Fund.....$	304,510.00
Darius Ogden Mills Fund.....	50,000.00
William R. Sands Fund.....	10,000.00
David Lydig Fund, Bequest of Charles P. Daly.....	34,149.86
Stokes Fund.....	3,000.00
Students' Research Fund.	3,317.00
Endowment Fund for Science and Education.....	66,845.00
Henry Iden Fund.....	10,000.00
John Innes Kane Fund.....	10,000.00
	$491,821.86

Temporary Funds

Special Book Fund for Library.....$	58.50	
Plant Fund, for plants.....	974.58	
Exploration Fund.....	24.05	
Income of Students' Research Fund...	15.67	
Income of Stokes Fund.....	58.73	
Charles Finney Cox Memorial Fund ..	6.90	
Income John Innes Kane Fund.....	6.66	$492,966.95

Investments	*Debit*	
Net Cost of		
$50,000 Ches. & Ohio, Gen'l. Mtge. Bonds		
50,000 So. Ry. Co. 1st Cons. Mtge. Bonds		
50,000 Erie R. R. Co. Prior Lien Bonds		
59,000 Erie R. R. Co. Penn.-Coll. Tr. Bonds		$312,424.18
50,000 Reading R. R. Co. J. C. Coll. Tr. Bonds		
24,000 Nor. Pac. R. R.-St. P. & D. Div. Bonds		
30,000 Nor. Pac. Gt. Nor. -C. B. & Q. Coll.		
10,000 N. Y. City, 4 per cent. Stock, 1959		
Investment, D. O. Mills Fund		
$53,000 Grand Trunk Railway Equipment Notes	50,015.63	
Investment, Science and Education Fund		
$10,000 New York Central Lines Equipment		
10,000 Louisville and Nashville Equipment	19,510.48	
Investment, Henry Iden Fund,		
$11,000 Milwaukee, Sparta and N. W. R. R. Bonds	10,120.00	
Director-in-Chief, Working Fund	25,000.00	
General Income Account, Balance borrowed from Permanent Funds	7,066.33	
Income of David Lydig Fund, Balance borrowed from Permanent Funds	1,024.63	
Income of D. O. Mills Fund	786.40	
Income of Henry Iden Fund	74.87	
Museum and Herbarium Fund	36.92	
Income of Science and Education Fund	261.75	
Cash in hand of Treasurer (on deposit with J. P. Morgan & Co.)	66,645.76	$492,966.95

REPORT OF THE SPECIAL AUDITOR

Treasurer's Account for the Year 1913

Room 3111, Grand Central Terminal,
New York, February 10, 1914.

Mr. Edward D. Adams,
Chairman, Finance Committee, New York Botanical Garden,
71 Broadway, New York, N. Y.

Dear Sir:

This is to certify that I have, by direction of the Board of Managers, examined the books and accounts of the Treasurer of the New York Botanical Garden, for the year nineteen hundred and thirteen (1913), together with their proper vouchers, and that I find the balance sheet and the Treasurer's statement of receipts and disbursements attached hereto to be correct.

I have also examined the various investment securities and find the same to be as reported in the said balance sheet.

Respectfully submitted,

A. W. Stone,
Special Auditor.

Director-in-Chief's Account for the Year 1913

Room 3111, Grand Central Terminal,
New York, February 10, 1914.

Mr. Edward D. Adams,
Chairman, Finance Committee, New York Botanical Garden,
71 Broadway, New York, N. Y.

Dear Sir:

This is to certify that I have examined and audited the financial books and accounts of the Director-in-Chief of the New York Botanical Garden for the year nineteen hundred and thirteen (1913), and that I find the same to be correct, and the cash balance to be as stated in the current cash book.

In accordance with recent practice, I have not included in this auditing the examination of the vouchers for City maintenance or construction work paid for by the City as such vouchers have been found proper and in order by the City Authorities, and it was decided in 1904 by the Chairman of the Finance Committee that a further examination of them was unnecessary. By like authority I have omitted also a detailed examination of the annual membership dues account. These dues are received by the Director-in-Chief and forwarded by him to the Treasurer, the former keeping a detailed record of the same.

Respectfully submitted,

A. W. Stone,
Special Auditor.

VOL. 8 NO. 31

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN

[ISSUED JULY 10, 1917]

CONTENTS:

Philippine Mosses, by ROBERT S. WILLIAMS. [*Issued separately, in advance, July 23, 1914.*] 331

The Vegetation of Vieques, by PERCY WILSON. [*Issued separately, in advance, June 9, 1917.*] 379

GENERAL INDEX 411

GENERIC INDEX 420

BULLETIN
OF
The New York Botanical Garden

Vol. 8 No. 31

Philippine Mosses

By Robert S. Williams

The mosses of the following list were obtained by the author while on a collecting trip in the Philippine Islands for the New York Botanical Garden, extending from October, 1903 to August, 1905. The specimens were chiefly collected at the following places. On the island of Luzon, about the Lamao river and Mt. Mariveles at its head, Oct. 1903 to March, 1904; then northward about 140 miles in the vicinity of Baguio and Mt. Santo Tomas, ten miles distant, April to Dec. 1904, ending the work in Luzon with a few days at Los Baños on Laguna de Bey in Jan. 1905. On leaving this island a trip was made to Mindanao where collections were obtained first in the southwest part, in the vicinity of San Ramon, the Sax river and adjacent mountains, some ten or twelve miles northwest of Zamboanga, Feb. and March, 1905, and finally along the west coast of the Gulf of Davao and on the slopes of Mt. Apo, chiefly in the vicinity of Todaya, a small native village, 900 to 1200 meters elevation. The elevation of the mountains above mentioned is about as follows. Mariveles, 1160 meters; Santo Tomas, 2438 meters; Apo, 3050 meters. Most of the elevations mentioned are estimates, only approximately correct. This list contains 240 species in 118 genera. Of these, 27 species and 3 genera have been described as new.

SPHAGNUM JUNGHUHNIANUM Dz. & Mb.

Baguio, 1575 meters elev., Nov. 1904 (1669). Specimens in fine fruit obtained earlier in the season were all destroyed by a fire.

TREMATODON CAPILLIPES C. M.

Between Baguio and Sablan, Nov. 1904 (1812); Kias Hill, Benguet Road, Sep. 1904 (3132).

GARCKEA PHASCOIDES (Hook.) C. M.

Lamao, on shady ground, 60 meters elev., Dec. 1903 (831); Loakan near Baguio, 1524 meters, Oct. 1904 (1808).

DITRICHUM DIFFICILE (Duby) Fleisch.

Baguio, 1575 meters, on earth walls, Oct. and Nov. 1904 (1815, 1816, 1821).

WILSONIELLA SQUARROSA Broth.

Twin Peaks, Benguet Road, 600 meters, Aug. 1904 (2070).

CERATODON STENOCARPUS B. S. G. Bry. Eur.

Mt. Santo Tomas at 1800 meters, Oct. 1904 (1818).

Dicranella insularis sp. nov.

Male flowers not found: plants rather loosely cespitose or somewhat gregarious; stems mostly 3 or 4 mm. high with spreading-flexuous or somewhat curved-secund leaves, the larger about 2.5 mm. long; upper stem and perichaetial leaves very similar, narrowly lanceolate, from a not or scarcely clasping base gradually narrowed to the very nearly or quite entire, acute apex, the leaf borders entire and often recurved nearly to the base; costa scarcely percurrent, 40–50 μ wide in lower part and about one seventh the width of the leaf; leaf-cells with scarcely thickened walls and elongate throughout, the median about 4 μ wide and 40–70 μ long, those of lower leaf about twice as wide; seta 10–15 mm. long, often sinuous and twisted, mostly red; capsule erect, oval-cylindric, smooth when dry and empty or finally becoming slightly wrinkled and contracted under the mouth, about 1 mm. long and 0.25 mm. in diameter, the exothecal cells 30–40 μ long by 16–20 μ wide, with slightly thickened, rather straight walls; peristome teeth undivided, 40 μ wide at base and extending 100 μ above the rim, reddish brown in the lower half and quite

smooth on the outer face, in the upper half paler and vertically striate-papillose; annulus none; lid conical with an erect beak, nearly as long as the capsule; spores rough, 16–20 μ in diameter; calyptra smooth, divided about one half up.

Lamao, on earth and rock, 60–90 meters elevation.

Type (832) on earth, Dec. 29, 1903, 60 meters; also collected on rock, 90 meters, Lamao, Nov. 24, 1903 (833). This species is near *D. Miqueliana* but the leaves are narrower above and entire and the exothecal cells in lower part of capsule longer and narrower.

DICRANELLA COARCTATA (C. M.) Dozy & Molk. Bryol. Jav.

Upper Lamao river, 660 meters, Feb. 1904, on earth (834); Baguio, 1570 meters, Oct. 1904, on cut bank (1861).

DICRANELLA POMIFORMIS (Griff.) Jaeg.

Kias Hill, Benguet Road, 1220 meters, Sep. 1904 (1862); Baguio, 1575 meters, Sep.–Nov. 1904 (1860, 1864, 1865, 1867). Previously known from Asia.

CAMPYLOPODIUM EUPHOROCLADUM (C. M.)Besch.

Baguio, 1570 meters, Sep.–Nov. 1904 (1863, 1866); Mt. Santo Tomas, 2100 meters, Oct.–Nov. 1904 (1859, 3133).

Rhabdoweisiella gen. nov.

Plants very small, with a few radicles at the base of the stem; stem oval in cross-section, with central strand; leaves pellucid, curved but scarcely crispate, the margins above crenulate; leaf-cells with prominent, solitary, mamillose papillae on both sides in the upper one half of the leaf, the cells below smooth, thin-walled, rectangular; costa vanishing well below the apex, in cross-section showing two large cells on ventral side and a stereid band of two rows of cells on the dorsal side; capsule erect, eight-ribbed when dry; annulus large, simple; peristome teeth 16, lanceolate, very close together, united in pairs mostly to near the apex, neither striate nor papillose, with rather prominent articulations; lid convex-acute; calyptra divided on one side to near the apex, conspicuously papillose throughout; spores large, rough.

The plants on which this genus is based look much like a small *Rhabdoweisia* but in structure they appear to be nearer *Oreoweisia*, from which they differ especially in the ribbed capsule, the broad, smooth peristome-teeth and the papillose calyptra.

Rhabdoweisiella papillosa sp. nov.

Apparently dioicous, the male flowers not found: plants minute, more or less gregarious, 2–4 mm. high; stems with a few radicles at the base, in cross-section oval, with large central strand; stem-leaves mostly 1 mm. or less long, when dry contorted, scarcely crispate, when moist erect-spreading, spatulate-oblong, obtuse, somewhat keeled, the margins flat, crenulate about half way down; costa stout, smooth, vanishing well below the apex of the leaf, in cross-section showing two large cells on the ventral side and a band of about two rows of stereid cells on the dorsal side; cells of leaf pellucid throughout, in the upper half of leaf not elongate, 12–16 μ in diameter, with solitary, mamillose papillae on both sides, the cells of lower leaf square to rectangular, not papillose, slightly convex; perichaetial leaves erect, loosely clasping, much like the stem-leaves but a little larger and more pointed with the smooth elongate cells of lower leaf extending higher up; seta somewhat curved, about 1.5 mm. long; capsule oblong, nearly erect, about 0.65 mm. long without lid, 8-ribbed when dry, the exothecal cells nearly square, with thin, straight walls slightly convex on the outer surface, the stomata obscure, few, near the base of the capsule; annulus distinct, of a single row of large cells; peristome teeth 16, lanceolate, united in pairs nearly to the apex, smooth between the prominent and rather close articulations; lid convex-acute, in height about equalling its basal diameter; calyptra cucullate, extending about one half way down the capsule, divided to near the apex, the upper ends of the cells projecting into conspicuous papillae over the entire outer surface; spores rough, 20–24 μ in diameter.

Baguio, 1570 meters ele., on the bark of the coffee tree (3131). Growing among fine tufts of *Bryum argenteum*, Oct. 10, 1904. (Plate 171.)

BRAUNFELSIA LUZONENSIS Broth.

Upper Lamao river, Jan. 1904, 1070 meters elev. (839);

Mt. Santo Tomas, Oct.–Nov. 1904, 1960 meters, on tree trunks (1845, 1851).

LEUCOLOMA PERVIRIDE Broth.

Upper Lamao river, on rock, 600 meters, Jan. 1904 (837, 838).

DICRANUM FRAGILE Hook.

Near Baguio, 1500 meters elev., on pine trunks, Oct. 1904 (1852); near Baguio, Dec. 1904 (2069). Previously known, I believe, only from India.

DICRANOLOMA BLUMEI (Nees) Ren.

Upper Lamao river, on trees, 1070 meters elev., March, 1904 (841).

DICRANOLOMA BRAUNEI (C. M.) Broth.

Mt. Santo Tomas, 1825 meters elev., Oct. 1904 (3134); Mt. Apo, March, 1905 (2655).

DICRANOLOMA LEUCOPHYLLUM (Hampe) Par.

Mt. Santo Tomas, 1850 meters elev., on tree trunks, Oct. 1904 (1852); Mt. Apo, 1950 meters elev., March, 1905 (2654).

DICRANOLOMA PERARMATUM Broth.

Mt. Apo, on trees, 1950 meters, March, 1905 (2656).

CAMPYLOPUS CAUDATUS (C. M.) Mont.

Mt. Santo Tomas, 2400 meters, on earth, Nov. 1904 (1858).

CAMPYLOPUS DENSINERVIS Broth.

Mt. Santo Tomas, on earth, 2400 meters, Nov. 1904 (3135). Apparently a few stems of this species growing mixed in with *C. Hildebrandianus*.

CAMPYLOPUS HILDEBRANDIANUS (Broth.) Fleisch.

Mt. Santo Tomas, on earth, 2400 meters, Nov. 1904 (1856).

CAMPYLOPUS ERICOIDES (Griff.) Jaeg.

Baguio, on decayed log, 1570 meters elev., Nov. 1904 (1847, 1848).

Campylopus subericoides sp. nov.

Dioicous, the male plants rather more slender than the fertile and mixed in with them: fertile plants erect, branching above, 3–4 cm. high, tomentose below; leaves rather uniformly placed along the stems or somewhat comose at the apex, erect-flexuous when dry, 5–6.5 mm. long, from an oblong-lanceolate base gradually narrowed to a pale or hyaline, serrulate point; costa one half or more the width of the leaf-base, about 200 μ wide, often slightly widening upward for a short distance before tapering to the apex, on the back slightly ribbed, in cross-section showing one row of large cells on the ventral side, a median row of cells about one half as large and on the dorsal side a stereid band; cells of lower part of leaf thin-walled, rectangular, broader toward the costa, gradually narrower toward the margin, but not forming a distinct border and no differentiated alar group; cells of upper part of leaf mostly elongate, rectangular to rhomboidal, forming a very narrow blade, the margin not quite entire and of hyaline cells; perichaetial leaves high-convolute, gradually tapering into a rough, more or less hyaline hair-point shorter than the clasping part: seta sinuous or geniculate, about 8 mm. high; capsule obovate when moist, with scarcely distinct neck, nearly symmetric and erect, about 1.5 mm. long without lid, furrowed when dry and smooth at the base: peristome-teeth reddish brown and vertically striate below, divided scarcely half way down into two pale, slightly papillose forks; annulus large; lid with a conical, nearly erect beak three fourths mm. long; calyptra descending about half way down the capsule, nearly smooth at the apex, fringed at the base; spores rough, up to 16 μ in diameter.

Mt. Santo Tomas, on earth near summit, 2400 meters, Nov. 1904 (1857).

This species in size and habit much resembles *C. ericoides*, differing especially in the smoother, hyaline hair-point and the smooth base of the capsule and apex of the seta.

CAMPYLOPUS FOXWORTHYI Broth.

Mt. Santo Tomas, on earth near summit, 2400 meters, NOV. 1904 (1855).

PILOPOGON BLUMEI (Dz. & Mb.) Broth.

Mt. Santo Tomas, 1950 meters elev., Oct. 1904 (1849); Baguio, 1570 meters, Sep. 1904 (1850).

Dicranodontium subasperum sp. nov.

Apparently dioicous: plants with stems mostly simple, 1–1.5 cm. high, radiculose in the lower part; stem-leaves erect-flexuous or slightly falcate-secund, 5–6 mm. long, subtubulose below and grooved above, rough in the upper one fourth, smooth and entire below, from a lanceolate bnse gradually tapering to a setaceous point; costa one third or more the width of the lower leaf and excurrent; the enlarged alar cells reddish brown to hyaline, forming more or less distinct auricles; cells just above, rectangular, wider toward the costa, gradually narrower and much smaller toward the margin, those of the very narrow blade of upper leaf narrowly rectangular; the inner perichaetial leaves with convolute base about 2 mm. long, rather abruptly narrowed to an erect-flexuous point, somewhat rough at the apex, about 4 mm. long; seta erect-flexuous or geniculate, smooth, 8 mm. high; capsule narrowly oblong with small mouth, smooth when dry and empty, about 1.75 mm. long without lid, the exothecal cells irregular, elongate, with walls much thickened; peristome teeth narrowly lanceolate, 35 μ wide at the rim of capsule, vertically and obliquely striate below, paler and slightly papillose in upper part, mostly divided three fourths way down or more into slender forks; lid with an erect beak, one half to three fourths mm. long, the cells at base in 7 or 8 rows transversely elongate and reddish; calyptra extending a little below the lid, smooth, not fringed; spores about 10 μ in diameter.

Type locality, Mt. Santo Tomas, on trunks of trees, about 1950 meters, Oct. 1904 (1846).

This species is intermediate between *D. attenuatum* of India and *D. asperulum*. The first has very smooth leaves, the second a much rougher leaf, serrulate nearly to the base and the base wider and more abruptly narrowed upward.

LEUCOBRYUM ADUNCUM Dz. & Mb.

Mt. Mariveles, 1220 meters, Jan. 1904 (845); Baguio, on stump, 1750 meters, Nov. 1904 (1829).

LEUCOBRYUM JAVENSE (Brid.) Mitt.

Upper Lamao river, 1000 meters, March 1904 (844).

LEUCOBRYUM SUBSANCTUM Broth.

Upper Lamao river, 1000 meters, March 1904 (843).

LEUCOPHANES CANDIDUM (Hsch.) Lindb.

Upper Lamao river, 912 meters elev., on trees, Jan. 1904 (846); Sax river, 260 meters, Feb. 1905 (2395).

OCTOBLEPHARUM ALBIDUM (L.) Hedw.

Lamao, 65 meters elev., Oct. 1903 (842); Baguio, on pine trunks, 1560 meters elev., Oct. 1904 (1679); Sax river, 180 meters elev., Feb. 1905 (2385); Santa Cruz, Gulf of Davao, 195 meters elev., June 1905 (3098).

FISSIDENS ANOMALUS Mont.

Mt. Santo Tomas, 1825 meters elev., Oct. 1904, on tree trunks (1787).

FISSIDENS BRAUNII (C. M.) Dz. & Mb.

Baguio, 1560 meters elev., Oct. 1904 (1790), on tree fern; Sax river, 600 meters, Feb. 1905, on tree fern (2388).

FISSIDENS NOBILIS Griff.

Baguio, 1570 meters elev., Sep. 1904 (1788); Baguio, Nov. 1904, on damp earth along stream (3136).

FISSIDENS SCHMIDII C. M.

Mt. Santo Tomas, 1800 meters, on earth between rocks of open hillside, Oct. 1904 (1786).

FISSIDENS XIPHIOIDES Fleisch.

Kias Hill, Benguet Road, 1200 meters Sep. 1904, on earth (1789).

FISSIDENS ZIPPELIANUS Dz. & Mb.

Lamao, 60 meters, Nov. 1903, on earth (3130).

SYRRHOPODON CURRANII Broth.

Road between Baguio and Sablan, Nov. 1904 (1805); Baguio, 1560 meters elev., on pine trunk, Sep. 1904 (1806); Baguio, on tree fern, Oct. 1904 (1807).

Syrrhopodon luzonensis sp. nov.

Apparently dioicous: plants with creeping, radiculose stems and irregular branches 2–4 cm. long; stem leaves more or less spreading-incurved or crispate when dry,

rather widely spreading when moist, 2–2.3 mm. long and 0.5–0.75 mm. wide, from an erect base, about as wide as high at the upper part and much narrowed below, extending into a broad oblong-lanceolate, acute point mostly 2 or 3 times as long, with undulate margins, slightly crenulate or papillose; costa about 40 μ wide in the lower part, ending just below the point of the leaf, smooth on the back or slightly papillose at the apex and often bearing a cluster of club-shaped propagulae, with 5 or 6 cross-walls; the cells of upper leaf mostly not or slightly elongate, rather irregular, with slightly thickened walls and minute papillae, the median cells about 4 μ in diameter; the cancellinae, filling most of the leaf-base, hyaline, mostly broadly rounded or truncate in outline above; the margin of leaf with a pale, yellowish border, 8–10 cells wide at the broadest part of the leaf, gradually narrowing upward and vanishing one third to one fourth way down from the apex of the leaf; perichaetial leaves erect, loosely clasping, scarcely differing from the stem leaves; seta smooth, about 4 mm. long; capsule narrowly oblong, 1.5 mm. long without the lid, the exothecal cells irregular, with thin walls, small and reddish about the rim, the median about 20 μ wide and 35–50 μ long, the basal much smaller, crowded, very irregular, without stomata; peristome of lanceolate teeth, rather irregular, brownish, slightly papillose, projecting about 60 μ above the rim; annulus none; lid with a long-subulate, erect beak; spores slightly rough, 16–18 μ in diameter; calyptra descending to near the base of the capsule, scabrous about half way down.

Type from Lamao river, Bataan province, 90 meters elev., on tree trunks (824) March, 1904; Lamao river, 60 meters, Dec. 1903 (823).

This species differs from *S. undulatus* in rather smaller leaf cells, a paler, more entire border and in having a lanceolate, acute, not broadly rounded apex of the leaf. *S. fasciculatus* has leaves about twice as long, also broader pointed and more serrulate.

SYRRHOPODON MÜLLERI (Dz. & Mb.) Lac.

Sax river, Mindanao, 150 meters elev., Feb. 1905 (2389); Santa Cruz, Gulf of Davao, near sea level, May 1905 (3099).

SYRRHOPODON REVOLUTUS Dz. & Mb.

Baguio, 1560 meters, Oct. 1904 (1828).

SYRRHOPODON TRISTICHUS Nees.

Upper Lamao river, 1060 meters elev., on trees, March 1904 (840).

SYRRHOPODON WALLISII C. M.

Lamao river, 150 meters, on trees, Jan. 1904 (811).

CALYMPERES CRISTATUM Hpe.

Upper Lamao river, 660 meters, Jan. 1904 (816); upper Lamao, 600 meters, March 1904 (820).

CALYMPERES DOZYANUM Mitt.

Lamao river, 60 meters, on *Ficus*, Dec. 1903 (815).

CALYMPERES MOLUCCENSE Schw.

Lamao river, 60 meters, Dec. 1903 (3137).

CALYMPERES VRIESEI Besch.

Lamao river, 90 meters, Dec. 1903 (814).

HYMENOSTYLIUM INCONSPICUUM Griff.

Baguio, 1570 meters, on limestone walls, Oct. 1904 (1674, 1675). Only reported before from India.

GYMNOSTOMUM RUPESTRE Schleich.

Baguio, 1570 meters, on rock walls, Sep. 1904 (1677).

The next nearest station known for this species is the Caucasus Mts.

TRICHOSTOMUM SUBDURIUSCULUM (C. M.) Broth.

Baguio, on rock, 1640 meters, Nov. 1904 (1813, 1819).

TIMMIELLA MERRILLII Broth.

Baguio, 1560 meters elev., Nov. 1904 (1814, 1817): Mt. Santo Tomas, 2000 meters elev., on earth between rocks on open hillside, Oct. 1904 (1820).

HYOPHILA DOZY-MOLKENBOERI Fleisch.

Baguio, 1560 meters, on rock, Sep. 1904 (1822).

HYOPHILA FLAVIPES Broth.

Baguio, on rock, Sep. 1904 (1823); Twin Peaks, Benguet road, Sep. 1904 (1825); Kias Hill, Benguet road, 1200 meters, Sep. 1904 (1827).

Hyophila rosea sp. nov.

Dioicous, the male plants very similar to the fertile: growing in thin, scarcely cohering mats over rock; the stems, without central strand and with outer walls of about 4 rows of thick-walled cells, often branching, 1–1.5 cm. long, radiculose at the base, with the leaves in clusters at intervals along the stem and at apex, often bearing more or less stellate propagulae on short, clustered filaments in the axils of the upper leaves; leaves when dry, twisted, flexuous, plicate, when moist, rather widely spreading, up to 3.3 mm. long and 0.7 mm. wide, from a narrow base, mostly gradually widening upward to above the middle, the apex rather broadly acute and scarcely apiculate; margin of leaf flat in upper part, more or less recurved below, minutely crenulate; costa stout, 80 μ wide at the base, percurrent or slightly excurrent, papillose on the back to well below the middle; cells of leaf rather obscure to near the base, roundish or angular, crowded, more or less mamillose and minutely papillose on both sides, the median about 6 μ in diameter, the basal mostly yellowish, smooth, elongate, scarcely rectangular except toward the margins; outer perichaetial leaves large, similar to those of the stem, the 1 or 2 inner leaves shorter, erect-spreading, not convolute below, with the elongate, smooth, basal cells extending a little farther up and the apex of leaf more narrowly acute, with the costa longer excurrent; capsule cylindric, 2–2.5 mm. long without lid, with very short neck and mostly few or no stomata, the exothecal cells up to 20 μ wide and 30–60 μ long with uniformly thickened walls; peristome none; annulus large; lid conical apiculate, up to three fourths mm. long; calyptra smooth, extending about one half way down the capsule; spores nearly smooth, 12–14 μ in diameter.

Type locality, Lamao river, on rock, 105 meters elev., Nov. 1903 (819); Lamao river, 70 meters elev., Nov. 1903 (818).

This species is near *H. apiculata* Fleisch. It differs in its larger size, the leaves rosulate and in having each cell of the leaf-margin projecting equally and often bearing minute papillae, also the basal cells are yellow and do not extend as far up the leaf and the apex of the leaf is broader and less apiculate, especially in the perichaetial leaves.

From *H. Micholtzii* it differs in the margin of the leaf, the perichaetial leaves and in the larger spores.

BARBULA ANGUSTIFOLIA (Hook. & Grev.) C. M.

Near Dagupan, just above sea level, Sep. 1904 (1824); San Ramon, Mindanao, near sea level, Feb. 1905 (3138).

BARBULA CONSANGUINEA (Thw. & Mitt.) Sb. in Jaeg.

Baguio, 1500 meters elev., on stones almost submerged in spring water, Oct. 1904 (1673); Sablan, Benguet Province, on rock, about 1000 meters, Nov. 1904 (3139). Heretofore only credited to Ceylon.

BARBULA CONSTRICTA Mitt.

Baguio, 1575 meters, on rock, Sep. 1904 (1826).

BARBULA ORIENTALIS (Willd.) Broth.

Manila, on the city walls, Sep. 1904 (2071).

MERCEYA BACANII Broth.

Baguio, 1570 meters, on wet limestone, Oct. 1904 (1676). These specimens are in good fruiting condition. As the original specimens were sterile the following description is given.

Perichaetial leaves loosely erect, scarcely differentiated; seta yellowish, about 7 mm. long; capsule oblong, 1–1.35 mm. long without lid and about 0.5 mm. in diameter, with 2 rows of small cells at the rim, the median exothecal cells broad, rather irregular, 4–6 sided, 30–40 μ wide by 40–50 μ long, with thin walls; lid conical, scarcely beaked, about 60 mm. high; annulus, peristome and stomata lacking; spores smooth, 8–10 μ in diameter; calyptra cucullate, smooth, extending to a little below the lid.

The Baguio specimens scarcely show any central strand in the stems and the outer cells have their walls scarcely thickened, also the cells in the border of the upper part of the leaf are not distinct from those within, but about half way down the leaf a more or less evident border may be seen.

MERCEYOPSIS MINUTA Broth. & Dixon.

Kias Hill, Benguet Road, 1200 meters elev., Sep. 1904 (1683).

These specimens seem to belong to the var. *subminuta* of Broth. & Dixon, the exothecal cells being mostly 20–30 μ wide. The leaf-points are rather broader and blunter than in any specimens observed from India.

The separation of the above genus from *Merceya* seems to leave the American species *Merceya latifolia* Kindb. in a rather anomalous position as it has, probably, as finely differentiated a border to the leaves as any of the known species and also a costa with a row of cells on the ventral side above the guide-cells.

DESMOTHECA APICULATA (Dz. & Mb.) Lindb.

Lamao river, 90 meters, on tree, Jan. 1904 (3140).

Macromitrium benguetense sp. nov.

Pseudautoicous, the male flowers minute, one fourth to one third mm. high, clustered in the axils of the upper stem leaves on very short stems radiculose at the base; the antheridia 1–3, with few paraphyses, enclosed by ovate-acute, costate leaves crenulate on the border: fertile plants in rather loose mats with elongate, creeping stems and short branches mostly one half cm. or less long; stem leaves strongly crispate in the upper part, somewhat linear-lanceolate, about 2.5 mm. long, deeply channeled above, the apex rather broadly acute, the margins mostly flat and crenulate to below the middle; costa smooth on the back, nearly or quite percurrent; cells of upper part of leaf pellucid, mamillose on both sides, 8–10 μ in diameter, those of the lower part elongate, in rows with furrows between and walls more or less thickened, extending about one fourth way up the leaf and more or less highly mamillose or papillose on both sides; inner perichaetial leaves shorter than the outer, narrowly lanceolate-pointed, loosely erect with mostly slightly elongate, scarcely mamillose cells extending to the apex; seta smooth, 7–9 mm. long; capsule broadly oval, about 1.5 mm. high without lid, scarcely or not ribbed when mature and dry, the mouth very small, the stomata in 2 or 3 rows near the base; peristome and annulus none; lid with a nearly erect beak about 1 mm. long; spores rough, 25–35 μ in diameter; calyptra mitrate with a few short hairs at apex, the base deeply slit when old.

Type locality, Baguio, on tree, 1570 meters, Oct. 1904 (830).

In habit this species is much like *M. involutifolium* and *M. intermedium*. The first has fewer elongate basal cells and a more cylindric capsule; the second has smaller, more obscure cells in the upper leaf, the basal part of leaf rougher, the capsule more elongate and a low peristome.

MACROMITRIUM CELEBENSE Par.

Sax river, Mindanao, on log, 550 meters elev., Feb. 1905 (3141).

MACROMITRIUM CUSPIDATUM Hampe.

Upper Lamao river, 1070 meters, on earth, Jan. 1904 (822).

MACROMITRIUM FOXWORTHYI Broth.

Upper Lamao river, 912 meters elev., on tree, Jan. 1904 (817); Sax river, March, 1905 (3142).

MACROMITRIUM GONIOSTOMUM Broth.

Mt. Apo, Mindanao, 2130 meters, March 1905 (2662).

MACROMITRIUM GONIORRHYNCHUM (Dz. & Mb.) Mitt.

Baguio, 1575 meters, Sep.–Nov. 1904 (1753 on trees and rock, 1754, on trees, 1761 on trees); Upper Lamao, Jan. 1904 (3143).

MACROMITRIUM LONGICAULE C. M.

Todaya, Mt. Apo, 1070 meters elev., on tree, April 1905 (2673).

Macromitrium Robinsonii sp. nov.

Autoicous, the male flower at the apex of a small branch from within the perichaetial leaves or from the stem below, of 4–8 antheridia with rather few paraphyses: plants in compact, yellowish brown mats with creeping stems and crowded branches mostly less than 1 cm. long; stem leaves crispate when dry, less than 2 mm. long and one fourth to one fifth mm. wide, oblong-lanceolate, acute, entire, the margins flat or slightly recurved and without border; costa smooth, nearly or quite percurrent; cells in lower one third or one fourth of leaf smooth, pale, elongate, thick-walled, in rows with furrows between, in the upper part obscure, roundish, about 5 μ in diameter, more or less mamillose or papillose; inner perichaetial leaves much smaller than the

outer, acutely pointed, the elongate cells often extending to the apex; seta smooth, 6–8 mm. long; capsule without lid about 1.5 mm. long, fusiform, more or less slightly ribbed, especially just under the very small mouth, when dry; peristome and annulus none; lid with acicular beak about 0.75 mm. long; spores finely papillose, up to 20 μ in diameter; calyptra small, cucullate, smooth, the base more or less slightly split.

Type from the Upper Lamao river, on tree, 1000 meters, Jan. 1904 (1760).

This species seems to be rather closely related to three Chilean species having the calyptra cucullate.

Named for my friend and correspondent on mosses of the Philippines, Dr. Charles Budd Robinson, who recently lost his life while on a collecting trip in Amboina.

MACROMITRIUM MERRILLII Broth.

Lamao river, 90 meters, on tree, Jan. 1904 (821).

MACROMITRIUM ORTHOSTICHUM Nees.

Sax river, Mindanao, Feb. 1905 (3144).

MACROMITRIUM REINWARDTII Schimp.

Mt. Santo Tomas, on tree, 1900 meters elev., Oct. 1904 (1757).

MACROMITRIUM SALAKANUM C. M.

Mt. Santo Tomas, on tree, 1900 meters elev., Oct. 1904 (1758); Sax river, Mindanao, on tree, March 1905 (2381).

MACROMITRIUM SULCATUM (Hook. & Grev.) Brid.

Baguio, 1550 meters elev., on tree, Sep. 1904 (1752); Mt. Santo Tomas, 2100 meters, Nov. 1904 (1751).

TAYLORIA INDICA Mitt.

Baguio, 1575 meters, on trees, Sep. 24, 1904 (1755); Baguio, Nov. 8, 1904 (3145). Apparently only before known from India.

TAYLORIA SUBGLABRA (Griff.) Mitt.

Mt. Santo Tomas, on trees, 2100 meters Oct. 1904 (1681). Only reported from India and Ceylon previously.

SCHLOTHEIMIA LUZONENSIS Broth.

Near Baguio, 1700 meters, on trees, Nov. 1904 (1759).

FUNARIA CALVESCENS Schwaegr.

Upper Lamao river, 1060 meters, on earth recently burned over, Jan. 1904 (847); Baguio, 1575 meters, Nov. 1904 (1832).

FUNARIA LUZONENSIS Broth.

Baguio, 1575 meters elev., Nov. 1904 (1830); Mt. Santo Tomas, 2100 meters, Oct. 1904 (1833).

Pseudopohlia gen. nov.

Dioicous. Plants of medium size with cells of leaf smooth and much elongate and resembling *Pohlia* except in the outer peristome which has the 16 teeth united in pairs three fourths way up or more by the outer plates only, the slightly papillose inner plates being more or less widely split except at the base and apex, with the opposing margins prominent and crenate.

Pseudopohlia bulbifera sp. nov.

Dioicous, the male plants about like the fertile with rather inconspicuous, elongate buds, the inner perigonal leaves reddish, very broad, costate, acute, nearly entire, the outer leaves about twice as long, serrulate, enclosing rather numerous antheridia and paraphyses about 0.35 mm. long: fertile plants in low, rather compact cushions, the stems reddish and radiculose below, with few branches, 1–1.5 cm. long; stem leaves erect when dry, slightly spreading when moist, decurrent, the upper 2–2.5 mm. long, rather broadly lanceolate, acute, the margins more or less recurved and distinctly serrulate in the upper one third, the lower leaves gradually much smaller; bulblets, much like those of *Pohlia commutata*, about one fifth mm. long, brown, ovate, with 4 or 5 leaf-like points on the upper part, frequently occur in the axils of the upper leaves; costa scarcely percurrent, prominent on the back of the leaf, smooth, 50–60 μ wide at the base; cells of leaf mostly narrow, with slightly thickened walls, the median about 8 μ wide and 50–100 μ long, the basal cells often much wider, those at the angles short-quadratic, about 16 μ wide and 18–28 μ long; outer perichaetial leaves longer and narrower than those of the stem, the inner leaves shorter; seta pale red, 4–7 cm. long; capsule erect, about 3 mm. long, fusiform, gradually tapering into the collum, the exothecal

cells with scarcely thickened, not sinuous walls, rather irregular, about twice longer than broad; collum rather shorter than the sporangium, with numerous superficial stomata around the middle; lid small, low, obtusely convex; annulus large, finely developed; outer peristome pale brown, papillose, the 16 teeth rather obtusely pointed, mostly united in pairs to well above the middle by the outer plates, the inner plates more or less widely separated except at the base and apex, with the opposing margins prominent and crenate; the inner peristome equalling the outer in height, irregularly developed, pale, slightly papillose, the basilar membrane over one third the entire height, the segments narrow, more or less divided or perforate, the mostly two cilia as long as the segments and sometimes united above; spores rough, the larger 20–22 μ in diameter.

Type found by road between Baguio and Sablan, Benguet Province, about 1250 meters elev., on rock, Nov. 1904 (1770). (Plate 172.)

POHLIA ELONGATA Hedw.

Baguio, 1570 meters elev., Oct. 1904 (1776): Mt. Santo Tomas, 1950 meters, Oct. and Nov. 1904 (1765, 1778).

POHLIA SCABRIDENS (Mitt.) Broth.

Baguio, 1570 meters, Dec. 1904 (1762).

Pohlia saxensis sp. nov.

Dioicous, the male plants 5 or 6 mm. high, with a somewhat conspicuous, terminal, elongate flower; the perigonial leaves, about like those of the perichaetium, enclosing rather numerous antheridia and paraphyses about 0.4 mm. long: fertile plants simple or somewhat branching, 1–1.5 cm. high, radiculose below, the leaves not crowded and rather equally foliate on the upper stem, not decurrent, erect-spreading, mostly 2–2.5 mm. long, ovate-lanceolate, with mostly flat, sometimes slightly recurved borders, distinctly serrulate in the upper part and minutely so below, often nearly to the base; costa mostly shortly excurrent into a serrulate point, smooth on the back, about 40 μ wide a little above the base; leaf cells rather pale, with thin walls, the median 6–8 μ wide and 80–120 μ long; perichaetial leaves about like those of the stem but somewhat broader; seta about 2.5 cm. long, pale reddish;

capsule mostly nodding, about 2.5 mm. long, the tapering neck as long as the sporangium; exothecal cells irregular, mostly 1–2 times longer than wide, the walls not thickened and scarcely or not sinuous; stomata superficial; teeth of peristome red at the base, brown above with hyaline border, the outer plates 35 or more in number, the lower 6–8 μ wide by 20–25 μ long, minutely punctate; segments from a high basilar membrane over one half the teeth in height, broadly perforate, the cilia 2 or 3 and long-appendiculate; annulus large; spores smooth, 12 μ in diameter.

Type from the Sax river, 250 meters elev., on log, Feb. 1905 (2393).

Compared with *P. nutans* this species has leaves rather broader in the upper part and less serrate; the leaf cells longer with thinner walls and the capsule smaller with a longer, more tapering neck.

BRACHYMENIUM EXILE (Dozy & Molk.) Dozy & Molk. Bryol. Jav.

Baguio, 1570 meters, on earth and rock, Nov. 1904 (1768); Kias Hill, 1200 meters, Sep. 1904 (1783).

BRACHYMENIUM NEPALENSE Hook.

Baguio, on trees, 1570 meters, Oct. 1904 (1777).

BRACHYMENIUM ACUMINATUM Harv.

Baguio, on earth walls, 1500 meters elev., Nov. 1904 (1767); Baguio, Oct. 1904 (1780).

ANOMOBRYUM CYMBIFOLIUM (Lindb.) Broth.

Trinidad, 1360 meters, on rock with *Philonotis*, Sep. 1904 (3146).

Bryum abditum sp. nov.

Apparently dioicous, no antheridia found: plants in compact dull green cushions; stems about 1 cm. long, with few branches and scattered radicles toward the base; leaves mostly aggregate and closely imbricate toward the apex of the stems and branches, forming a more or less elongate bud, the lower leaves smaller and distant; stem-leaves mostly 1 mm. or less long and about 0.6 mm. wide, short-oblong, somewhat concave, the margins flat, entire, without border, the apex rather abruptly rounded to an

entire apiculus formed by the stout, excurrent costa; cells of leaf pale, with thin walls, toward the apex rhomboidal, the median hexagonal, 40–50 μ long by 16 μ wide, those toward the base more or less rectangular with a few in the angles often square; outer perichaetial leaves slightly longer than the stem-leaves, gradually lanceolate-pointed, with slightly excurrent, reddish costa; seta 1–2 cm. long; capsule pyriform, 2–3 mm. long and about 1 mm. in diameter, the neck one half as long to nearly as long as the sporangium; exothecal cells with uniformly thickened walls, the median about 20 μ wide and 30–40 μ long, those in the neck mostly smaller and shorter, with abundant stomata in several rows; outer peristome golden brown at the base, the lanceolate, paler teeth about 200 μ high, minutely punctate on the outer face, the lamellae on the inner side prominent and about 12 μ apart; the inner peristome as long as the outer, finely papillose, the segments narrowly lanceolate, perforate, the cilia rudimentary, from a basal membrane about two fifths the height of the teeth; lid convex-conic, about as high as broad; annulus of 3 rows of cells; spores minutely papillose, 16–18 μ in diameter.

Baguio, 1570 meters ele., on rock-walls, Sep. 1904 (3170).

A species somewhat like *B. japonense*, but this latter has the basal membrane of the inner peristome only about one half as high, the outer plates of the teeth striate and the leaves without apiculus; also the leaf-cells larger.

BRYUM ARGENTEUM L.

Baguio, 1570 meters elev., on the coffee tree, Oct. 1904 (3147); Baguio, Nov. 1904 (1771).

BRYUM AUSTRALE Hampe.

Antamok, near Baguio, 1000 meters, on damp rock, Oct. 1904 (1779); Baguio, on rock, 1570 meters elev., Sep. 1904 (1782); Sablan, Benguet Province, about 700 meters, on rock, Nov. 1904 (3148); between Baguio and Sablan, on rock, Nov. 1904 (1769).

BRYUM CAPILLARE L.

Baguio, on rock, 1570 meters, Sep. 1904 (1785).

BRYUM CORONATUM Schwaegr.

Lamao, 65 meters, on earth, Dec. 1903 (813).

BRYUM DECAISNEI Dozy & Molk.

Mt. Santo Tomas, on earth, 1900 meters elev., Nov. 1904 (1764).

RHODOBRYUM GIGANTEUM (Hook.) Par.

Mt. Santo Tomas, 2300 meters, on fallen logs, Nov. 1904 (1763); Mt. Apo, 1800 meters, April 1905 (2659).

MNIUM ROSTRATUM Schrad.

Mt. Santo Tomas, 1960 meters, on decayed log, Oct. and Nov. 1904 (1766, 1781).

ORTHOMNIUM LOHERI Broth.

Baguio, 1570 meters, on trees, Sep. 1904 (1680).

HYMENODON ANGUSTIFOLIUS Sande Lac.

Sax river, Mindanao, 700 meters elev., on tree fern, March 1905 (2382).

Described from sterile specimens from the Celebes. The Sax river plants are quite abundantly fruiting. They have seta about 2 cm. long; capsule oblong, 1.5 mm. long and slightly over 0.5 mm. in diameter when moist; lid conical, obliquely subulate, about 0.7 mm. long; inner peristome pale, the segments, from a not papillose membrane projecting a little above the rim, distant, rather irregular, almost linear and often perforate or split along the more or less distinct median line; spores, not quite smooth, about 12 μ in diameter; calyptra small, smooth, split about half way up on one side.

RHIZOGONIUM SPINIFORME (L.) Bruch.

Upper Lamao river, 760 meters, on trees and rock, Jan. 1904 (848); Baguio, 1570 meters elev., Oct. 1904 (1784); Mt. Santo Tomas, 1825 meters, Oct. 1904 (3149); Mt. Apo, 1970 meters, one of the most abundant mosses, April 1905 (2664).

PHILONOTIS GRIFFITHIANA (Wils.) Mitt.

Trinidad, near Baguio, 1250 meters elev., Sep. 1904 (1872); Mt. Santo Tomas, 1825 meters, on rock, Oct. 1904 (1873).

PHILONOTIS IMBRICATULA Mitt.

Road between Baguio and Sablan, 1200 meters, on rock, Nov. 1904 (1870).

PHILONOTIS TJIBODENSIS (Fl.) Broth.

Near San Ramon, slightly above sea level, on cut bank, Feb. 1905 (2390).

PHILONOTIS TURNERIANA (Schw.) Mitt.

Baguio, 1570 meters, Oct. 1904 (1871); road between Baguio and Sablan, on rock, Nov. 1904 (1869).

BREUTELIA ARUNDINIFOLIA (Duby) Broth.

Mt. Santo Tomas, 2400 meters, Nov. 1904 (1868).

BREUTELIA MERRILLII Broth.

Mt. Santo Tomas, 1970 meters, Oct. 1904 (1875); Loakan near Baguio, Oct. 1904 (1874).

WEBERA INVOLUTA (Mitt.) C. M.

Upper Lamao river, 600 meters, on rock, Jan. 1904 (825); Lamao river, 150 meters, Jan. 1904 (826).

CATHARINAEA FLAVISETA (Mitt.) Broth.

Baguio, Nov. and Dec. 1904 (1792, 1793).

RACELOPUS PILIFER Dozy & Molk.

Lamao river, 90 meters, on rock, Nov. 1903 (827).

POGONATUM ALBOMARGINATUM (C. M.) Jaeg.

Mt. Santo Tomas, 1825 meters elev., in grassy meadow, Oct. 1904 (1601).

POGONATUM BENGUETIAE C. M.

Baguio, 1570 meters, Nov. 1904 (1795).

POGONATUM MICROPHYLLUM Dz. & Mb.

Upper Lamao river, 690 meters elev., Feb. 1904 (828); Baguio, Oct. and Nov. 1904, on earth and rock (1794, 1799, 1800); Mt. Santo Tomas, 1850 meters, Oct. 1904 (1798).

POGONATUM MICROSTOMUM (R. Br.) Brid.

Mt. Santo Tomas, 2400 meters, Nov. 1904 (1791).

POGONATUM NUDIUSCULUM Mitt.

Baguio, 1570 meters, along streams, Sep. 1904 (1796); Baguio, Oct. 1904 (1804); Mt. Santo Tomas, 1850 meters, Oct. 1904 (1797).

POGONATUM SPURIO-CIRRHATUM Broth.

Mt. Santo Tomas, 1800 meters, Oct. 1904 (1803).

POGONATUM WALLISII C. M.

Mt. Santo Tomas, 1850 meters, Oct. 1904 (1802).

ACROCRYPHAEA CONCAVIFOLIA (Griff.) Dozy & Molk.

Baguio, 1570 meters, on trees, Sep. 1904 (1810).

GLYPTOTHECIUM SCIUROIDES (Hook.) Hampe.

Mt. Santo Tomas, 2100 meters, on trees, Oct. 1904 (1854).

NEOLINDBERGIA RUGOSA (Mont.) Fleisch.

Sax river, Mindanao, on tree trunk, Feb. 1905 (2397).

SPIRIDENS LONGIFOLIUS Lindb.

Upper Lamao river, 1000 meters, on tree fern, Feb. 1904 (829); Mt. Santo Tomas, 2100 meters, Oct. 1904 (1888).

TRACHYLOMA INDICUM Mitt.

Baguio, 1570 meters, on tree, Oct. 1904 (1738); Mt. Santo Tomas, 2000 meters, Oct. 1904 (3150).

ENDOTRICHELLA ELEGANS (Dozy & Molk.) Broth.

Baguio, 1570 meters, on trees, Sep. 1904 (1887).

ENDOTRICHELLA GRACILESCENS (Dz. & Mb.) Broth.

Sax river, Mindanao, on tree, 240 meters, March 1905 (2383).

GAROVAGLIA PLICATA (Nees) Endl.

Baguio, 1570 meters, Nov. 1904 (1831); Todaya, Mindanao, 1200 meters, on tree, April 1905 (2674).

Garovaglia punctidens sp. nov.

Pseudautoicous, the male plants very small, sparsely scattered over the older leaves, the flowers solitary, 0.35–0.50 mm. high, the broadly ovate-acute, more or less serrulate perigonial leaves enclosing few or no paraphyses and 1–3 antheridia about 0.1 mm. long: fertile plants with primary stems creeping, tomentose, the secondary erect or somewhat curved, 2–5 cm. long; leaves crowded, somewhat plicate, spreading-undulate on all sides, broadly ovate-lanceolate, up to 2 mm. wide and about 4.5 mm. long, the widest part about one fourth way up leaf, the

margins entire below the middle, serrulate above and more or less spiny dentate just below the short, flexuous, dentate point scarcely 0.4 mm. long; costa none; cells of leaf with unequally thickened walls, the lumen in those of upper leaf about 8 μ wide and 30–40 μ long, in lower leaf, 4–6 μ wide and 40–60 μ long, the basal cells mostly pale golden brown, the alar often shorter and broader and forming a rather distinct group; perichaetial leaves extending well above the capsule, the breadth near the apex nearly equalling the height, the apex more or less truncate and serrulate with a very short, slightly serrulate apiculus; seta one half mm. or less long; capsule oblong, scarcely 2 mm. long without lid, the exothecal cells irregular, about twice as long as wide, with thin walls; lid low-convex, apiculate; peristome double, attached well below the rim, the outer of 16, lanceolate, golden brown, smooth teeth more or less irregularly divided along the median line, the 6 or 7 outer plates above the rim rather broad and with a round thin spot or opening near the center of each; the inner peristome as high as the outer, of paler, irregular often almost filiform segments, from a low, basilar membrane; calyptra conical-apiculate, papillose, above, often bearing sterile archegonia on its surface; spores rather immature, rough, 20 μ or more in diameter.

Type locality, Baguio, 1570 meters elev., on tree trunks, Nov. 1904 (3151).

Garovaglia luzonensis sp. nov.

Pseudautoicous, the male plants minute, mostly scattered over the older leaves, the ovate-acute antheridial leaves somewhat serrulate or entire, enclosing 1–3 antheridia about 0.14 mm. long without paraphyses: fertile plants with primary stems creeping, tomentose, the secondary erect or curving, mostly 3–5 cm. high; stem-leaves about 1.5 mm. wide and 2.5–3 mm. long, erect-spreading on all sides, plicate, not undulate, ovate, rather broad in the upper part and somewhat abruptly narrowed to a short, slightly serrulate point, the leaf-margin finely serrulate in the upper one third, quite entire below the middle; costa none; cells of leaf with unequally thickened lateral walls, the lumen of upper cells 6–8 μ wide and 40–55 μ long, of lower cells a little narrower and often much longer, the basal cells mostly short, brownish, the alar frequently

forming a distinct cluster of hyaline or brown cells about 20 μ wide and slightly elongate; perichaetial leaves extending a little above the capsule, in the upper part about as broad as long, convolute, more or less truncate, with a short, entire or nearly entire apiculus and distinctly serrulate for a short distance on either side of its base; seta much shorter than the capsule; capsule oblong or ovate, 1.5 mm. long without lid, the exothecal cells pale, irregular, up to about twice longer than wide, with thin walls and stomata lacking; peristome double, attached well below the mouth, the outer of lanceolate teeth more or less irregularly divided along the median line, nearly smooth, pale, the articulations rather distant, the inner, apparently, very imperfect, of a few irregular, narrow segments; lid low, apiculate; calyptra convex, conical-apiculate, slightly rough above and often bearing sterile archegonia near its base; spores irregular, rough, up to 30 μ in diameter.

Baguio, 1570 meters elev., on tree-fern, Sep. 1904 (1878); Baguio, on tree, Dec. 1904 (2072).

This species seems to be one of the smallest of the genus, the stems with the spreading leaves, when dry, measuring only 2 or 3 mm. across.

Jagerinopsis luzonensis sp. nov.

Dioicous, the male plants similar to the fertile, the rather slender, inconspicuous flowers about 1 mm. long, in the axils of the upper leaves, with 8–10 antheridia about 0.4 mm. long, and rather few, filiform paraphyses enclosed by 7–8 broad, shortly pointed, entire leaves: fertile plants with creeping, more or less radiculose stems and distant, erect or curved, mostly simple branches 1–2 cm. high; stem-leaves mostly 2 mm. or less long and 0.65–0.75 mm. wide, closely placed, widely spreading all around either wet or dry, from a somewhat ovate-heart-shaped base, rather gradually narrowed to a lanceolate point distinctly serrulate toward the apex and minutely serrulate below to near the base of leaf; costa 40 μ wide in lower leaf and extending about two thirds way up the leaf; leaf-cells elongate, smooth or nearly so with walls somewhat thickened except at the rounded ends, the lumen in the cells of upper leaf about 4 μ across and 20–30 μ long, toward the leaf base somewhat narrower and longer, the basal cells brownish and shorter without distinct alar groups; inner

perichaetial leaves ecostate, erect, longer than those of the stem, often reaching to the base of the capsule, somewhat abruptly narrowed to a lanceolate, serrulate point; seta smooth, erect, 2.5–3 mm. long; capsule erect, ovate or oblong, about 1.5 mm. long without the lid, the exothecal cells reddish and slightly transversely elongate in 7–8 rows at the mouth, the median cells not elongate or partly elongate, about 20 μ wide, and sometimes 40 μ long, with cell-walls slightly and uniformly thickened; stomata and annulus none; lid with an erect, subulate beak, about two thirds the length of the capsule; peristome of 16 teeth, attached a little below the mouth, bent inward when dry, when moist, erect and extending 40–60 μ above the rim, pale, golden brown, broad and bluntly pointed, with a rather indistinct median line and not papillose or striate but with each outer plate more or less highly convex; spores smooth or nearly so, up to 28 μ in diameter; calyptra cucullate, rough at the apex, reaching to the base of the capsule.

Type locality, upper Lamao river, on trunks of trees, 560 meters, March 1904 (835).

SYMPHYSODONTELLA ATTENUATULA Fleisch.

Mt. Santo Tomas, 1970 meters, on limbs, Oct. 1904 (3152).

SYMPHYSODONTELLA CYLINDRACEA (Mont.) Fleisch.

Mt. Apo, on trees, 1975 meters, April 1905 (2669).

SYMPHYSODONTELLA SUBULATA Broth.

Mt. Santo Tomas, on trees, 2100 meters, Nov. 1904 (1684); Mt. Santo Tomas, 1970 meters, Oct. 1904 (1685).

PTEROBRYOPSIS CRASSICAULIS (C. M.) Fleisch.

Upper Lamao river, on trunks, 1070 meters, March 1904 (836).

PAPILLARIA AONGSTROEMII C. M.

Mt. Santo Tomas, 1960 meters, pendent from trees, Oct. 1904 (3153).

Known previously only from the Society Islands. What seems undoubtedly to be this species was collected bearing quite numerous archegonial flowers containing a large number of elongate, filiform, more or less flexuous and

entangled paraphyses and a well developed calyptra, smooth in the upper part and more or less hairy below.

PAPILLARIA FUSCESCENS (Hook.) Jaeg.

Upper Lamao river, 1070 meters, on rock, Feb. 1904 (853); Baguio, 1570 meters, on rock, Sep. 1904 (1699).

AEROBRYOPSIS LONGISSIMA (Dozy & Molk.) Fleisch.

Mt. Santo Tomas, 2100 meters, Oct. 1904 (1697).

FLORIBUNDARIA FLORIBUNDA (Dz. & Mb.) Fleisch.

Mt. Santo Tomas, 1970 meters, on trees, Oct. 1904 (1686).

FLORIBUNDARIA THUIDIOIDES Fleisch.

Todaya, Mt. Apo, 1160 meters elev., on tree, April 1905 (2671).

Barbella elongata sp. nov.

Dioicous, the male plants very similar to the fertile, with often abundant, ovate flowers, 1.5 mm. long, scattered, 1–3 in number, along the middle of the branches; the antheridial leaves ecostate, ovate, with a more or less lanceolate, entire point, enclosing 6–8 antheridia 0.4 mm. long on a distinct stalk 0.1 mm. long, and rather few paraphyses: plants with slender, pendent stems 60 cm. long or more, with distant, widely spreading, terete branches mostly 1–2 cm. long; stem-leaves loosely erect, often slightly decurrent, more or less finely papillose on both sides, ovate-lanceolate, gradually tapering into a more or less filiform point of variable length, serrulate all round, the blade about 0.7 mm. wide and 2 mm. long not including the point, the distinct costa extending about 1 mm. up the leaf; leaves on the upper part of the branches about like those of the stem but smaller and often scarcely papillose, about 1 mm. long, the lower leaves small and short-ovate; cells of leaf mostly narrow, elongate, with single small papillae near the middle, the median 4 μ wide by 40–60 μ long, the alar often forming a quite distinct, convex group of short, broad cells; inner perichaetial leaves erect, faintly costate, smaller than the stem-leaves, the slender point nearly or quite entire; seta mostly slightly curved, not quite smooth, about 3 mm. long; capsule oblong, 2.5 mm. long without the lid, wide mouthed and

somewhat tapering to the distinct neck when dry and empty, the exothecal cells mostly four-sided, more or less square to short-rectangular, up to 30 μ wide and 30–40 μ long, with rather thin walls; stomata none; peristome-teeth brown, lanceolate, 60–70 μ wide at the base, tapering to a very slender, subulate point, with a zigzag median line, the outer plates finely cross-striate one third way up or more, the point above papillose; inner peristome pale brown, papillose, the basal membrane about one fourth the entire height, the segments narrow, keeled, with narrow slits along the median line and cilia rudimentary or none; annulus broad, of two rows of cells; lid highly convex, with the oblique beak about 1 mm. long; spores slightly rough, about 25 μ in diameter; calyptra mitrate, somewhat rough at the apex, with 5 or 6 short slits at the base, the basal margin more or less thickened and incurved.

Mt. Santo Tomas, 2000 meters, pendent from branches, Oct. 1904 (1694): Baguio, 1570 meters, sterile, Oct. 1904 (1693).

METEORIOPSIS RECLINATA (C. M.) Fleisch.

Baguio, 1570 meters, on trees, Oct. 1904 (1692).

AEROBRYUM LANOSUM Mitt.

Upper Lamao river, 1070 meters, on rock, Feb. 1904 (3154).

AEROBRYUM SPECIOSUM Dozy & Molk.

Mt. Santo Tomas, 1970 meters, Oct. 1904 (1687); Baguio, 1550 meters, on trees, Oct. 1904 (1695); Mt. Apo, 2000 meters, April 1905 (2663).

TRACHYPUS HISPIDUS (C. M.) Par.

Mt. Santo Tomas, on trees, 1970 meters, Oct. 1904 (1756).

TRACHYPUS HUMILIS Lindb.

Mt. Santo Tomas, on trees, 1970 meters, Oct. 1904 (1836).

TRACHYPODOPSIS CRISPATULA (Hook.) Fleisch.

Mt. Santo Tomas, 1830 meters, on rock, Oct. 1904 (1722).

CALYPTOTHECIUM CRISPULUM (Dozy & Molk.) Broth.

Todaya, 850 meters, on trees, April 1905 (2670).

CALYPTOTHECIUM TUMIDUM (Dicks.) Fleisch.

Baguio, 1570 meters, on trees, Oct. 1904 (1690); Baguio, Oct. 1904 (1691); Mt. Apo, on trees, 1900 meters, March 1905 (2660).

Neckera luzonensis sp. nov.

Apparently dioicous, the male flowers unknown: primary stems creeping, the secondary erect, simple or divided, 8–10 cm. high, pinnately plumose, the older branches often bearing numerous flagella only 25–30 μ in diameter and 4–5 mm. long, with very minute scale-like leaves; secondary stem-leaves in 8 rows, lingulate, somewhat asymmetric, about 3.5 mm. long by 1.5 mm. wide, undulate, the margin slightly serrulate about one third way down, the apex obtuse or slightly acute, the base broadly decurrent; branch leaves very similar to those of the stem, smaller, the terminal often 1 mm. or less long; costa slender, extending well above the middle of the leaf or rarely short and forking; cells of leaf prosenchymatose with slightly thickened and minutely pitted walls throughout, in the upper part of leaf elongate, somewhat rhomboidal near the apex, those of lower leaf narrow and elongate to the short, brown basal cells, the alar not forming a distinct group; median cells 4–5 μ wide and 30–40 μ long, those of lower leaf 5–6 μ wide and 60–80 μ long; inner perichaetial leaves erect, about 3 mm. long, from an ovate, clasping base gradually narrowed to a narrowly lanceolate or ligulate point exceeding the broader part in length and distinctly serrulate at the apex; fruit unknown.

Mt. Santo Tomas, Luzon, 1975 meters, on trunk of tree, Oct. 1904 (1698).

NECKEROPSIS GRACILENTA (Lac.) Fleisch.

Lamao river, 100 meters, on twigs, Nov. 1903 (850).

NECKEROPSIS LEPINIANA (Mont.) Fleisch.

Baguio, 1570 meters, on trees, Sep. 1904 (1689); Mt. Apo, 1980 meters, April 1905 (2665).

NECKEROPSIS NITIDULA (Mitt.) Fleisch.

Baguio, 1570 meters, on trees and rocks, Oct. 1904 (1670).

NECKEROPSIS SCROBICULATA (Nees) Fleisch.

Lamao river, 45 meters, on rock, Nov. 1903 (849).

HIMANTOCLADIUM LORIFORME (Lac.) Fleisch.

Itogen near Baguio, 1070 meters, on rock, Oct. 1904 (1688).

HIMANTOCLADIUM PLUMULA (Nees) Fleisch.

Sax river, Mindanao, on tree trunk, 150 meters, Feb. 1905 (2386).

Himantocladium nanum sp. nov.

Flowers and fruit unknown: plants very small, the primary stems creeping, the secondary erect, 10–15 mm. high, without paraphyllia, quite regularly pinnately branched with the lowest branches sometimes the longest and again pinnately divided; secondary stem leaves in 8 rows, slightly complanate, asymmetric, mostly recurved on one side toward the base, 0.6–.7 mm. long and about 0.4 wide, ovate, the upper part broad with the apex mostly rounded and the margins nearly entire or very minutely serrulate or papillose to below the middle; branch leaves like those of the stem but smaller, the terminal leaves about 0.25 mm. long; costa smooth, ending 6–8 cells below the point of the leaf, sometimes sending off short branches from the upper part; cells of leaf with scarcely thickened walls, parenchymatose and roundish in the upper part, 6–8 μ in diameter, in the lower leaf mostly elongate, somewhat prosenchymatose, 6–8 μ wide and 12–20 μ long, the marginal cells nearly square, the alar not forming a distinct group.

Todaya, Mt. Apo, 850 meters elevation, on trees with *Calyptothecium crispulum*, April 1905 (3156).

This species appears to be most closely related to the plant called *Thamnium parvulum* Mitt., from the Neilgherry Hills of India. It differs in being still smaller, with smaller leaves, the margins less serrulate and the cells of leaf larger than in the Indian species. It has much the habit of *Himantocladium plumula* but is very much smaller and the leaves not undulate, broader above, more rounded and entire and the cells larger.

HOMALIODENDRON FLABELLATUM (Dicks.) Fleisch.

Baguio, 1570 meters, on trees, Sep. 1904 (1696); Mt. Santo Tomas, 2100 meters, Nov. 1904 (3155); Mt. Apo, 1980 meters, March 1905 (2666).

The following species do not appear to be specifically different from *H. flabellatum*, viz., *H. Javanicum* (C. M.) Fleisch, *H. ligulaefolium* (Mitt.) Fleisch, *H. scalpellifolium* (Mitt.) Fleisch, and *H. squarrulosum* Fleisch.

POROTRICHUM SUBSERIATUM (Hook.) Mitt.

Mt. Santo Tomas, 2000 meters, Oct. 1904 (1721).

Thamnium Sandei Besch. and *Thamnium Schmidii* (C. M.) Jaeg., the first from China and Japan, the second from the Neilgherry Hills, India, do not seem to differ in any way from this species.

Clastobryum papillosum n. sp.

Flowers and fruit not found: plants small and slender, with creeping stems a centimeter or two long and irregularly scattered branches mostly 4–8 mm. long, bearing chiefly in the axils of the upper leaves numerous filiform, brown propagulae 0.5–0.6 mm. long and composed of a row of cylindric, finely papillose cells about 20 μ in diameter and 30–40 μ long; leaves ovate-lanceolate, rather distant, erect-spreading, somewhat complanate, 1–1.25 mm. long, concave, the margins flat or slightly recurved, serrulate all round, slightly decurrent, strongly papillose on the back in the upper part; cells of leaf mostly linear, with thin, not pitted walls, those of lower leaf 4 μ wide and 40–60 μ long, becoming gradually shorter in the blade above, the alar group very distinct, brown, of 4–5 inflated cells.

Baguio, 1570 meters elev., on tree, mixed with *Chaetomitrium*, Oct. 1904 (3157).

CLASTOBRYUM ROBUSTUM Broth.

Mt. Santo Tomas, 2000 meters, Oct. 1904 (3158).

ENTODON LONGIDENS Broth.

Baguio, 1570 meters, on tree, Oct. 1904 (1883); Baguio, on rock, Dec. 1904 (2073); Todaya, Mt. Apo, on rock, March 1905 (2651).

CAMPYLODONTIUM FLAVESCENS (Hook.) Dozy & Molk. Bryol. Jav.

Baguio, 1570 meters, on the coffee tree, July, Sep. 1904 (1884, 1885).

PYLAISIA SECUNDA (Hook.) Jaeg.

Baguio, 1570 meters, on rock, Nov. 1904 (1707).

ERYTHRODONTIUM SQUARRULOSUM (Mont.) C. M.

Twin Peaks, Benguet Road, Sep. 1904 (1876); Baguio, 1570 meters, on tree, Sep. 1904 (1877); Todaya, 850 meters, on tree, March 1905 (2653).

TRACHYPHYLLUM PAPUANUM (Broth.) Broth.

Kias Hill, Benguet Road, 930 meters, on bark, Sep. 1904 (1742).

Only reported before, I believe, from Thursday island on the north coast of Queensland, Australia.

STEREOPHYLLUM ANCEPS (Dozy & Molk. Bryol. Jav.) Broth.

Twin Peaks, Benguet Road, 600 meters, Sep. 1904 (1744).

DALTONIA ANGUSTIFOLIA Dozy & Molk.

Baguio, 1570 meters elev., on the coffee tree, Nov. 1904 (1665).

DALTONIA CONTORTA C. M.

Baguio, on the coffee tree, Oct. 1904 (1666).

DISTICHOPHYLLUM CUSPIDATUM Dozy & Molk.

Todaya, Mt. Apo, 1220 meters, April 1905 (2672).

DISTICHOPHYLLUM MITTENII Dozy & Molk. Bryol. Jav.

Baguio, 1570 meters, Sep. 1904 (1667).

DISTICHOPHYLLUM OSTERWALDII Fleisch.

Baguio, 1570 meters, on damp earth in shade, Oct. 1904 (1668).

DISTICHOPHYLLUM TORTILE Dozy & Molk. Bryol. Jav.

Upper Lamao river, 600 meters, on wet rock, Feb. 1904 (851).

CYCLODICTYON BLUMEANUM (C. M.) Broth.

Baguio, on log, Oct. 1904 (1740); Todaya, Mt. Apo, 1070 meters, on log, March 1905 (2652).

CALLICOSTELLA PAPILLATA (Mont.) Jaeg.

Lamao river, 140 meters, on rock, Jan. 1904 (852).

CHAETOMITRIUM LANCEOLATUM Dozy & Molk. Bryol. Jav.
Baguio, 1570 meters, on trees, Sep., Oct. 1904 (1723, 1739).

CHAETOMITRIUM WEBERI Broth.
Sax river, Mindanao, April 1905 (3159).

ACTINODONTIUM ASCENDENS Schwaegr.
Baguio, 1570 meters, on the coffee tree, Nov. 1904 (1664).

HYPOPTERYGIUM MUELLERI Hampe.
Baguio, 1570 meters, on rock and wood, Sep. 1904 (1879).

HYPOPTERYGIUM STRUTHIOPTERIS Brid.
Baguio, 1570 meters, on trunks of trees, Oct. 1904 (1682); Mt. Santo Tomas, 2000 meters, Oct. 1904 (3160); Mt. Apo, on trees, 2000 meters, April 1905 (2657).

CYATHOPHORELLA ADIANTUM (Griff.) Fleisch.
Baguio, 1500 meters, on stems of grasses and bushes near the base, Oct. 1904 (1672).

CYATHOPHORELLA HOOKERIANA (Griff.) Fleisch.
Baguio, on grass stems and branches of trees near the ground, Oct. 1904 (1671).

RHACOPILUM INDICUM Mitt.
Baguio, on rock, Sep., Nov. 1904 (1772, 1773).

RHACOPILUM SPECTABILE Reinw. & Hornsch.
Baguio, 1570 meters, on rock, Sep. 1904 (1774); Mt. Santo Tomas, 1900 meters, Oct. 1904 (1775); Mt. Apo, 2000 meters, April 1905 (2668).

PSEUDOLESKEOPSIS DECURVATA (Mitt.) Broth.
Baguio, on wet rock by stream, Sep., Oct. 1904 (1731, 1737).

This species has only been reported before from Japan. The Philippine specimens are in fine condition and show the mature lid to be often convex-obtuse and never really acuminate as appears sometimes in the immature fruit. The apex of the leaf is quite variable, from rather broadly rounded to almost acute.

CLAOPODIUM PRIONOPHYLLUM (C. M.) Broth.

Baguio, 1570 meters, on rock, Sep., Oct. 1904 (1724, 1837).

Previously known from India, Java and the Celebes.

PELEKIUM VELATUM Mitt.

Lamao river, 100 meters elev., on logs, Dec. 1903 (857); Los Baños, Laguna de Bay, Jan. 1904 (2075); Sax river, Mindanao, Feb. 1905 (2396).

THUIDIUM CYMBIFOLIUM (Dozy & Molk.) Dozy & Molk. Bryol. Jav.

Baguio, 1570 meters, on rock, Oct. 1904 (1840); Mt. Santo Tomas, 2000 meters, Oct. 1904 (1838); Todaya, Mt. Apo, 1100 meters, March 1905 (3161).

THUIDIUM INVESTE (Mitt.) Jaeg.

Lamao river, 70 meters, on rock, Dec. 1903 (856); Twin Peaks, Benguet Road, 650 meters, Sep. 1904 (1844).

This species is described as having a smooth seta but it seems to have a seta always more or less rough in the upper part, also the perichaetial leaves somewhat costate.

Thuidium kiasense sp. nov.

Autoicous, the male flower about 0.50 μ long, on the stem near the fertile flower, the antheridial leaves pale, costate, ovate-lanceolate, nearly entire, enclosing about 4 antheridia with few paraphyses: plants very small, in thin, loose, rather pale green mats; stems with scattered radicles, few, nearly simple, filiform paraphyllia, and rather irregular, scarcely divided branches 2–5 mm. long; stem-leaves one half mm. or less long, distant, ovate-lanceolate, very acute, sometimes almost hair-pointed, papillose-serrate on the flat margins; branch leaves incurved when dry, erect-spreading when moist, the larger near the middle of the branch, about 0.4 mm. long, the margins papillose-serrate, the apex broadly acute or somewhat rounded; costa ending below the apex, more or less papillose or slightly serrulate on the back and mostly ending in a short point; cells of leaf pale, distinct, 4–6 sided, the median about 6 μ wide and 8 μ long, mamillate and unipapillate on both sides except in the elongate point of the stem leaves where they become smooth and elongate, the terminal cell of the

branch leaves not elongate and ending with 2 papillae; perichaetial leaves up to 1 mm. long, slightly serrulate, either gradually long-lanceolate, sometimes almost hair-pointed or more abruptly pointed, with some coarse teeth at the base of the point, the costa pale, often indistinct; seta 5–6 mm. long, rough throughout; capsule oblong, about 0.75 mm. long without the lid, the exothecal cells irregular, thin-walled, more or less convex, mostly 25–30 μ wide and not elongate to rarely twice longer than wide; stomata none; annulus of 1 or 2 rows of cells; teeth of outer peristome lanceolate, finely cross-striate on outer face in lower part, about one half up becoming obliquely or vertically striate and toward the apex papillose; inner peristome of narrow, solid segments nearly as high as the teeth with sometimes 1 or 2 short cilia between them; lid conical-subulate, sometimes as long as the capsule; calyptra cucullate, scarcely extending below the lid, covered with scattered hairs; spores not quite smooth, up to 16 μ in diameter.

Kias Hill, Benguet Road, 950 meters elev., on bark, Sep. 1904 (1834).

This species in size and habit is much like *T. involvens* of America.

THUIDIUM MEYENIANUM (Hpe.) Dozy & Molk. Bryol. Jav.

Lamao river, 65 meters elev., on tree trunk, Dec. 1903 (855); Lamao river, 75 meters, on rock, Oct. 1903 (858); Baguio, 1570 meters, on tree, Oct. 1904 (1839); Twin Peaks, Benguet Road, 670 meters, Sep. 1904 (1841).

T. trachypodum (Mitt.) Dozy & Molk. Bryol. Jav., ranging from India to Java and the Philippines is not distinct, I believe, from the above.

THUIDIUM PLUMULOSUM (Dozy & Molk.) Dozy & Molk. Bryol. Jav.

Lamao river, 135 meters, on damp rock and wood by stream, Jan. 1904 (854); Los Baños, Laguna de Bay, Jan. 1905 (2074); Sax river, Mindanao, 100 meters, on rock, Feb. 1905 (2394).

THUIDIUM TAMARISCELLUM (C. M.) Lac.

Baguio, 1570 meters, on rock, Sep. 1904 (1835); Baguio, on trees, Sep. 1904 (1843).

CAMPYLIUM GLAUCOCARPON (Reinw.) Broth.

Baguio, 1570 meters, on bark Sep. 1904 (1842).

CTENIDIUM LYCHNITES (Mitt.) Broth.

Mt. Santo Tomas, 2000 meters, on rock, Oct. 1904 (1708, 1710).

Ctenidium mindanense sp. nov.

Autoicous, the male flowers about 0.2 mm. high, with broadly ovate-acute, subserrulate leaves, enclosing 5–6 antheridia and a few short paraphyses: plants in rather compact, yellowish green mats with short, creeping, radiculose stems and irregular, erect branches usually much less than 1 cm. long; stem-leaves nearly or quite ecostate, broadly ovate-lanceolate to somewhat cordate-triangular, with narrow, sometimes subulate point, mostly about 0.5 mm. wide and 0.65 mm. long, concave, plicate, the margins flat and very minutely serrulate nearly all round, the back of the leaf mostly minutely papillose by the projecting upper ends of the cells; branch leaves quite similar to those of the stem but often distinctly bicostate; cells of the leaf quite uniform throughout, the median 3–4 μ wide and 25–35 μ long, a few alar cells shorter and broader but scarcely forming a distinct group; perichaetial leaves rather few and inconspicuous, from an ovate or oblong base gradually narrowed to a narrowly lanceolate not quite entire point with sometimes a few coarse teeth at its base; seta nearly or quite smooth, 8–10 mm. long; capsule nodding, short-oblong, up to nearly 1 mm. long and 0.6 mm. wide, the exothecal cells more or less hexagonal, slightly or not elongate, up to 35 μ wide and rarely 40 μ long, with thin walls, apparently without stomata; outer peristome pale, the teeth crowded, united to a little above the rim, finely cross-striate in the lower part, obliquely or vertically striate near the middle and nearly smooth toward the apex; the inner peristome darker colored than the outer and slightly exceeding it in height, smooth, of segments nearly linear in the upper part, broadened at the base and with narrow slits along the median line; annulus of one row of rectangular cells; lid highly convex with an oblique, subulate beak about two thirds the length of the capsule; spores not quite smooth, up to 16 μ in diameter; calyptra, with scattered, erect or spreading hairs over the lower part, extending somewhat below the lid.

Sax river, Mindanao, 100 meters, on tree, Feb. 1905 (2392).

This species is somewhat like *C. ceylanicum* Card. but the leaves are relatively broader, shorter pointed and more plicate.

Elmeriobryum Brotheri sp. nov.

Evidently dioicous, the male flowers not found: plants in compact, greenish yellow cushions with more or less procumbent stems, without paraphyllia, bearing radicles here and there in tufts and crowded, subpinnate, curving branches mostly 1 cm. or less long with somewhat secund, crowded leaves; stem-leaves about 1.4 mm. long by 0.6 mm. wide, more or less irregularly plicate, broadly ovate-lanceolate, acuminate, entire, mostly shortly bicostate, the margins flat; branch-leaves smaller, usually bicostate, more shortly pointed, sometimes slightly serrulate at the apex, concave and often somewhat plicate; cells of leaf smooth, very narrow and elongate, often slightly vermicular, the median about 4 μ wide and 30–40 μ long, the basal with scarcely thickened or pitted walls, the alar forming a distinct group in the stem-leaves, of enlarged, mostly oblong, pale cells, not so evident in the branch-leaves; inner perichaetial leaves up to 3 mm. long, erect, slightly plicate, ecostate, the point entire or minutely serrulate with sometimes a few coarse teeth some distance below the apex; seta smooth, up to 3 cm. long; capsule nodding, not quite symmetric, oblong, contracted under the mouth when dry, 2–2.25 mm. long without lid by 1.25 in diameter, the exothecal cells irregular, mostly somewhat elongate, with thin walls, the stomata few and indistinct in the short neck; lid convex-mamillate; teeth of outer peristome brown, united to a little above the rim, closely articulate, with distinct zigzag median line and a hyaline border, the inner peristome pale brown, smooth, about as high as the outer, from a basal membrane one third to nearly one half the height of the teeth, the narrow segments keeled, with narrow slits along the median line and 1–3 paler, slightly papillose and nodose cilia between them; annulus broad, about two rows of cells in height; calyptra small, smooth, tapering-cylindric from a narrow base, slit about half way up; spores rough, mostly 22–25 μ in diameter mingled with a few up to 35 μ in diameter.

Baguio, 1600 meters, on rock, Sep. 1904 (1728).

ELMERIOBRYUM PHILIPPINENSE Broth.

Between Baguio and Mt. Santo Tomas, 1800 meters, on rock, Nov. 1904 (1706); Baguio, 1570 meters, on rock, Sep. 1904 (1729).

This species was originally described from sterile specimens. It is dioicous. The male plants are similar to the fertile, the flowers, scarcely 1 mm. high, are scattered along the stem, the broadly ovate-acute, concave, entire, ecostate leaves enclosing 7–8 antheridia and rather abundant, longer paraphyses; the antheridia are about 250 μ long on a stalk about 50 μ long. The seta is smooth, often nearly 5 cm. long, the capsule short-oblong, nodding, strongly curved and contracted under the mouth when dry and empty, the annulus of 2–3 rows of cells, the lid convex-mamillate, the outer peristome-teeth, with hyaline border, united to well above the rim, the inner segments pale, papillose, keeled, with narrow slits along the median line, and 2–3 papillose cilia, sometimes nearly as long, between them.

MACROTHAMNIUM MACROCARPUM (R. & H.) Fleisch.

Mt. Santo Tomas, 2000 meters, Oct. 1904 (1709).

ECTROPOTHECIUM CALLICHROIDES (C. M.) Jaeg.

Sablan, Benguet Province, 650 meters, on trees, Nov. 1904 (1702).

ECTROPOTHECIUM CYPEROIDES (Hook.) Jaeg.

Lamao river, 600 meters, on log, Feb. 1904 (873); Sablan, 650 meters, on rock, Nov. 1904 (1700).

ECTROPOTHECIUM LUZONIAE (C. M.) Jaeg.

Mt. Santo Tomas, 2000 meters, Oct. 1904 (3162); Mt. Santo Tomas, on branches, Nov. 1904 (1748).

ECTROPOTHECIUM MONUMENTOSUM (Dub.) Jaeg.

Lamao, 100 meters, on rock, Dec. 1903 (869); Lamao, on rock, Jan. 1904 (860).

ECTROPOTHECIUM SUBINTORQUATUM Broth.

Baguio, 1570 meters, on log, Sep. 1904 (1750).

ECTROPOTHECIUM VERRUCOSUM (Hampe) Jaeg.

Baguio, on rock, Sep. 1904 (3163); Baguio, on wood, Oct. 1904 (1747); Sablan, 750 meters, on tree, Nov. 1904 (1701); Los Baños, on log, Jan. 1905 (2076); Sax river, Mindanao, 250 meters, on log, Feb. 1905 (2391).

STEREODON DEFLEXIFOLIUS (Mitt.) Broth.

Mt. Santo Tomas, 2000 meters, on logs, Oct. 1904 (1713).

Stereodontopsis gen. nov.

Dioicous plants in habit like *Stereodon* but with a simple peristome of distant, linear-lanceolate teeth, having a distinct, not zigzag median line and distant, finely papillose articulations. The stems in cross-section are oval, without central strand, the calyptra hairy.

Stereodontopsis flagellifera sp. nov.

Dioicous, the male plants similar to the fertile, with inconspicuous flowers about 0.7 mm. long, the outer perigonial leaves with a short-lanceolate, nearly entire point, the inner leaves shorter, broadly ovate, acute or somewhat obtuse, enclosing 6–8 antheridia and rather abundant, filiform paraphyses: plants growing in rather loose, yellowish green mats with procumbent or erect stems 4–5 cm. long, bearing scattered radicles, rather few, lanceolate paraphyllia, mostly rather short, irregular branches and often numerous filiform flagella 4–8 mm. long; stems in cross-section oval, showing about 5 rows of thick-walled outer cells and no central strand; leaves crowded, falcate-secund, ovate-lanceolate, ecostate, more or less plicate, entire or minutely serrulate at the apex, 1.5–2 mm. long; leaf-cells narrow, elongate, with slightly thickened, not pitted walls, the median about 4 μ wide by 40–60 μ long, the alar forming a distinct group of short sometimes inflated, pale cells; perichaetial leaves erect, scarcely or not plicate, ovate-lanceolate, gradually tapering to a slender, entire or slightly serrulate apex, the longer inner leaves about 2.5 mm. long; seta about 15 mm. long, distinctly roughened toward the apex; capsule erect, cylindric, nearly straight, about 2 mm. long without the lid, somewhat furrowed at the small neck, with about 2 rows of stomata at the base of the sporangium, the exothecal cells rather irregular, slightly elongate, with rather thin,

nearly straight walls; peristome single, of distant, narrowly lanceolate, erect teeth with rather distant articulations, a distinct, not zigzag median line and finely papillose on the outer face; no annulus or lid found; calyptra (immature) covered with long, slender, mostly erect hairs; spores 8–10 μ in diameter.

Sax river, Mindanao, 550 meters elev., on log, Feb. 1905 (2387). (Plate 173.)

TRISMEGISTIA KORTHALSII (C. M.) Broth.

Mt. Apo, 2000 meters, March 1905 (2667).

ISOPTERYGIUM ALBESCENS (Schw.) Jaeg.

Baguio, 1570 meters, on bark and old logs, Sep.–Nov. 1904 (1705, 1712, 1730, 1741).

ISOPTERYGIUM ARQUIFOLIUM (Lac.) Jaeg.

Lamao river, on earth along stream, 75 meters, Nov. 1903 (868); Lamao river, on wet rock, 110 meters, Dec. 1903 (867).

ISOPTERYGIUM BANCANUM (Lac.) Jaeg.

Lamao river, 60 meters, on bark, Dec. 1903 (862).

ISOPTERYGIUM LONGICAULE Broth.

Lamao river, 65 meters, on rock, Nov. 1903 (871).

Isopterygium saxense sp. nov.

Dioicous, the male flowers abundant on both stems and branches: plants in rather pale green mats with elongate, creeping stems bearing scattered radicles, lanceolate-filiform paraphyllia and subpinnate, short branches; stems in cross-section oval, 100 μ by 180 μ, with a rather small and indistinct central strand and about 2 rows of somewhat thick-walled outer cells; stem-leaves about 1 mm. long and one fourth mm. wide, ecostate, rather broadly lanceolate, tapering to a slender, nearly entire or slightly serrulate point, the branch-leaves smaller, much shorter and broadly pointed, more serrulate, at the apex of the branches only about one half mm. long; leaf-cells quite uniform, the median 5–6 μ wide and 40–50 μ long, the alar not differentiated; perichaetial leaves long-lanceolate, the slender, serrulate point more or less spreading-flexuous, the inner leaves nearly 2 mm. long; seta 12–14 mm. long; capsule nodding or pendent, short-oblong, scarcely 1 mm.

long without the lid, somewhat contracted under the mouth when dry, the exothecal cells mamillose, mostly not elongate, up to 20 μ in diameter with walls scarcely thickened and stomata none; lid highly convex-apiculate when moist, its height about equalling the basal diameter; annulus broad; outer peristome normal, the inner brown, papillose, with segments not quite as long as the teeth, scarcely slit along the keel and with solitary, stout, paler cilia terminating in a filiform point; spores not quite smooth, 12–14 μ in diameter.

Sax river, Mindanao, near San Ramon, at slight elevation, on log, Feb. 1905 (3164).

A species about the size of *I. albescens* but with broader and shorter pointed leaves and the stem-leaves more serrulate, as well as different inflorescence.

TRICHOSTELEUM HAMATUM (Dozy & Molk.) Broth.

Baguio, 1570 meters, on bark, Oct. 1904 (3165).

TAXITHELIUM INSTRATUM (Brid.) Broth.

Lamao river, 60 meters elev., on decayed wood and bark, Nov. and Dec. 1903 (861, 872).

Trichosteleum petrophilum sp. nov.

Autoicous, the male flowers 0.4 mm. high, scattered on both stems and branches, the perigonial leaves broadly ovate-lanceolate, nearly entire, enclosing 4–5 antheridia 120 μ long and few paraphyses: plants very small, with loosely entangled, creeping stems scarcely forming mats, bearing few, irregular branches 2–4 mm. long and scattered radicles on the under side; leaves complanate, rather distant, widely spreading, the lateral stem-leaves ovate-acute, about four fifths mm. long, ecostate, slightly serrulate nearly all round, the dorsal and ventral leaves smaller and narrower; branch-leaves very similar to those of the stem; leaf-cells narrow, elongate, the median 4 μ wide by 30–60 μ long, with a row of 3–6 papillae along the middle, the alar smooth, rectangular, scarcely forming a distinct group; inner perichaetial leaves erect-spreading, a little over 1 mm. long, ovate-lanceolate, gradually narrowed to a slender, nearly or quite entire point; seta smooth, 6–8 mm. long; capsule nodding, more or less strongly curved and contracted under the mouth when dry, about

0.8 mm. long without the lid, the exothecal cells more or less irregularly short-rectangular, with thin walls, the stomata rather inconspicuous in about 2 rows near the base; peristome-teeth about 40 μ wide at the base and 200 μ high, finely cross-striate below and papillose above, the lamellae on the inner face sometimes projecting 40 μ or more; segments of the inner peristome from a high basal membrane, lanceolate, keeled, solid, finely papillose, with single, stout cilia between, sometimes nearly as long as the segments; annulus none; lid convex, with a short, oblique beak; spores nearly smooth, up to 12 μ in diameter.

Lamao river, 75 meters, on rock, Dec. 1903 (865).

VESICULARIA CAMPYLOTHECIA (Broth.) Broth.

Lamao river, 60–90 meters, on rock, Nov., Dec. 1903 (864, 870).

VESICULARIA MEYENIANA (Hpe.) Broth.

Twin Peaks, Benguet road, on rock, 650 meters, Sep. 1904 (1745).

VESICULARIA MONTAGNEI (Bel.) Fleisch.

Baguio, 1570 meters, on log, Oct. 1904 (1749).

VESICULARIA SPLENDIDA Broth.

Baguio, on rock by stream, Nov. 1904 (1703).

MEIOTHECIUM ATTENUATUM Broth.

Baguio, on the coffee tree, Sep. 1904 (1743).

MEIOTHECIUM MICROCARPUM (Harv.) Mitt.

Baguio, Sep. 1904 (1735).

CHIONOSTOMUM ROSTRATUM (Griff.) C. M.

Baguio, on the bark and leaves of trees, Sep. 1904 (1734).
Previously reported only from India and Ceylon.

Rhaphidostegium philippinense sp. nov.

Autoicous, the male flowers scattered along the stems, the inner antheridial leaves largest, about one half mm. long, broadly ovate and rather abruptly narrowed to a short-lanceolate, slightly serrulate point and enclosing 5 or 6 antheridia one sixth mm. long, with few or no paraphyses: plants very small, in rather compact mats with slender, creeping stems and irregular branches, usu-

ally 3–5 mm. long; stem and branch-leaves very similar, ecostate, 1–1.2 mm. long and 0.14–0.10 mm. wide, more or less falcate-secund, narrowly lanceolate, attenuate into a flexuous, serrulate point, the margins more or less incurved; leaf-cells smooth, narrowly linear, the median 3–4 μ wide and 30–40 μ long, the alar group of usually 2 large, hyaline or colored, inflated cells; inner perichaetial leaves scarcely 2 mm. long, erect, rather abruptly narrowed to a serrulate point about one third the broader part in length; seta 10–15 mm. long, slightly rough in the upper part; capsule oblong, mostly nodding, about 1.5 mm. long without the lid, the exothecal cells nearly square or somewhat elongate, 16–20 μ wide by 20–40 μ long, the walls thickened at the angles, the stomata in one row near the base; lid conical-subulate, about as long as the capsule; annulus lacking; teeth of outer peristome not furrowed, cross-striate about two thirds way up, the point papillose and rather blunt, the inner peristome as high as the outer, the segments, from a high basal membrane, slightly papillose, keeled, solid or with very narrow slits along the median line, with 1 or 2 shorter cilia between them; calyptra smooth; spores slightly rough, 20–24 μ in diameter.

Mt. Santo Tomas, 2000 meters, on decayed wood, Oct. 1904 (3166).

RHAPHIDOSTEGIUM SAPROXYLOPHILUM (C. M.) Jaeg.

Lamao river, 75 meters, Dec. 1903 (866).

RHAPHIDOSTEGIUM TRISTICULUM (Mitt.) Jaeg.

Baguio, 1570 meters, on the coffee tree, Sep. 1904 (1732); Baguio, on pine, Nov. 1904 (1733); Itogen, near Baguio, 1200 meters, on decayed wood, Oct. 1904 (1715).

WARBURGIELLA CUPRESSINOIDES C. M.

Mt. Santo Tomas, on log, 2000 meters, Oct. 1904 (3167).

SEMATOPHYLLUM ALTOPUNGENS (C. M.) Jaeg.

Mt. Mariveles, 1220 meters, Jan. 1904 (876).

SEMATOPHYLLUM BREVIPES Broth.

Baguio, 1570 meters, on bark of the pine, Sep. 1904 (1727).

SEMATOPHYLLUM FALCIFOLIUM Fleisch.

Mt. Mariveles, 1220 meters, Jan. 1904 (3168).

SEMATOPHYLLUM HERMAPHRODITUM (C. M.) Besch.

Mt. Apo, 2000 meters, on trees, March 1905 (2661).

SEMATOPHYLLUM HYALINUM (Reinw.) Jaeg.

Upper Lamao river, 1000–1100 meters, on trees, Jan. 1904 (874, 875).

SEMATOPHYLLUM MACROTIS C. M.

Between Baguio and Sablan, on rock, Nov. 1904 (1725).

SEMATOPHYLLUM SIGMATODONTIUM (C. M.) Jaeg.

Upper Lamao river, 1070 meters, March 1904 (877); Baguio, on earth, 1570 meters, Sep. 1904 (1726).

S. Robinsonii Broth., it seems to me, is scarcely distinct from this species.

SEMATOPHYLLUM SUBULATUM (Hpe.) Jaeg.

Upper Lamao river, 760 meters, on trees, Jan. 1904 (859).

MACROHYMENIUM STRICTUM Dozy & Molk. Bryol. Jav.

Todaya, Mt. Apo, 1220 meters, on tree, April 1905 (2675).

Determined from the description. These plants have a conic, stoutly beaked lid about 1.5 mm. high and a cucullate calyptra descending about half way down the capsule, smooth except at the slightly roughened apex. The quite rough spores are 20 μ in diameter. The type is from Borneo and has previously not been collected elsewhere.

Pleuropus appressifolius sp. nov.

Evidently dioicous, the male flowers not found: fertile plants in compact, rather glossy mats; stems creeping, radiculose, with more or less erect, mostly simple, terete branches 1–2 cm. long; branch-leaves closely appressed-imbricate when dry, erect-spreading when moist, ovate-lanceolate, about 2 mm. long and 0.65 mm. wide, acutely pointed, deeply plicate, serrulate all round; costa stout in the lower part, extending about two thirds way up the leaf, smooth, sometimes ending in a short thorn-point; leaf-cells elongate to near the base with rather thin, not pitted walls, the median slightly vermicular, 4–5 μ wide and 40–50 μ long, the basal cells pale, slightly or not elongate, 12–15 μ

wide, with scarcely thickened walls and extending in a broad band across the leaf base, the widest cells toward the costa; inner perichaetial leaves ecostate, erect, 2.5 mm. long, gradually narrowed to a lanceolate, serrulate point; seta smooth, 2 cm. long; capsule erect, ovate-cylindric, about 2.5 mm. long without the lid, the exothecal cells with quite evenly and slightly thickened walls, 15–20 μ wide by 30–50 μ long, the stomata abundant, in 4–5 rows at the base; lid with slightly oblique beak rather over one third the length of the rest of the capsule; annulus none; outer peristome of pale, lanceolate teeth about 250 μ high, with prominent articulations on the outer face and plates finely papillose to near the base, the basal plates close together and smooth; inner peristome a very papillose membrane about one third the height of the teeth with irregularly incised margin scarcely forming segments; calyptra extending well down the capsule, bearing scattered, erect-flexuous hairs on the basal half; spores minutely roughened, 16 μ in diameter.

Baguio, 1570 meters elev., on rock, Sep., Nov. 1904 (1880, 1881).

This plant looks much like and perhaps stands nearest to *Homalothecium tokiodense* (Mitt.) Besch. *P. appressifolius* differs in having the points of the leaves broader and shorter, the cells of the leaf-base larger with thinner walls and the peristome-teeth broader in the upper part with the joints less prominent. I may add that I do not think *Homalothecium* is in any way distinct as a genus from *Pleuropus*. (Plate 174.)

PLEUROPUS LUZONENSIS Broth.

Baguio, 1570 meters, on tree, Sep. 1904 (1882).

At once distinguished from the preceding by the spreading leaves, the longer leaf-point, the leaf-base of elongate, narrow cells toward the costa, also by the shorter pedicel and striate teeth of the peristome.

BRACHYTHECIUM BUCHANANI (Hook.) Jaeg.

Baguio, on ledges of rock, Oct. 1904 (1716).

BRACHYTHECIUM OXYRRHYNCHIUM (Dz. & Mb.) Jaeg.

Baguio, on rock, Sep., Nov. 1904 (1704, 1746).

BRACHYTHECIUM PLUMOSUM (Sw.) Bruch & Schp.

Mt. Santo Tomas, 2000 meters, on rock and logs, Oct. 1904 (1711, 1719, 1720).

Oxyrrhynchium distantifolium sp. nov.

Apparently dioicous: plants in very thin, loose, yellowish green mats with creeping stems 10–15 cm. long, bearing few leaves, scattered radicles and irregular and distant, more or less flagelliform branches from 1 to several cm. long; stem and branch-leaves similar, distant and widely spreading, not decurrent, the terminal much smaller; the larger leaves up to 1.35 mm. long and 1 mm. wide, broadly ovate, not plicate, the margins flat and serrulate to near the base, the apex forming a short, very acute point; costa vanishing about three fourths way up the leaf, often ending in a thorn point; cells of leaf very narrow, more or less vermicular, with thin walls, sometimes minutely papillose at the upper ends, the median 4–5 μ wide by 60–80 μ long, the alar broader and shorter, pale, scarcely forming a distinct cluster; perichaetial leaves somewhat spreading-squarrose, the inner about 2 mm. long, from a broadly clasping base gradually narrowed to a lanceolate, serrulate point; seta smooth, 2–4 cm. long; capsule more or less horizontal, 1.5 mm. long without the lid, curved and much contracted under the oblique mouth when dry and empty, the exothecal cells from nearly square to twice longer than wide, with somewhat unequally thickened walls, the stomata small, in several rows near the base; annulus broad; outer peristome with teeth 120 μ wide at the base and 750 μ high, reddish brown, cross-striate below with hyaline margin, the apex pale and papillose; the inner peristome from a high, golden brown, minutely papillose basal membrane bearing segments nearly equalling the teeth in height with narrow slits along the keel and with 2 or 3 slender, elongate, papillose cilia between them; lid highly convex, with an oblique beak sometimes as long as the rest of the capsule; spores not quite smooth, 14 μ in diameter; calyptra nearly smooth at the apex, descending to a little below the lid.

Baguio, 1570 meters, on rock, Oct. 1904 (1718).

RHYNCHOSTEGIUM CELEBICUM (Dozy & Molk. Bryol. Jav.) Jaeg.

Baguio, on damp earth and roots, Oct. 1904 (1717).

HYPNODENDRON COPELANDII Broth.

Mt. Apo, 2000 meters, April 1905 (2658).

HYPNODENDRON VITIENSE Mitt.

Baguio, 1570 meters, Oct. 1904 (1886); Mt. Apo, 2000 meters, April 1905 (3169). The Mt. Apo specimens are somewhat smaller than those from Baguio and fruiting. All the specimens are somewhat smaller than the type from the Fiji islands but seem to show no essential differences. The Apo plants have a seta 2–3 cm. long bearing a curved and nodding, more or less cylindric, 8-ribbed capsule about 5 mm. long without the lid; a conic lid with short, oblique beak 2 mm. long; a finely developed annulus; a peristome with teeth finely cross-striate to above the middle, the slender point pale and papillose, the inner segments finely papillose and split almost or quite to the very slender apex, with 2 or 3 slender, nodose cilia between them and borne on a pale, smooth basilar membrane almost one half the height of the teeth; the spores, nearly smooth are about 12 μ in diameter.

MNIODENDRON FUSCO-MUCRONATUM (C. M.) Broth.

Mt. Apo, 2000 meters, growing over rock and earth, April 1905 (2658*a*).

DESCRIPTION OF PLATES

PLATE 171. RHABDOWEISIELLA PAPILLOSA.

FIG. 1. Plant, ×15 dia. 2. Stem-leaf, ×37 dia. 3. Perichaetial leaf, ×37 dia. 4. Median and border cells of leaf, ×300 dia. 5. Cross-section of stem, ×300 dia. 6. Cross-section of part of leaf, ×300 dia. 7. Capsule with lid, ×45 dia. 8. Part of peristome, annulus and rim of capsule, ×150 dia. 9. Calyptra, ×37 dia. 10. Basal cells of leaf on one side, ×300 dia.

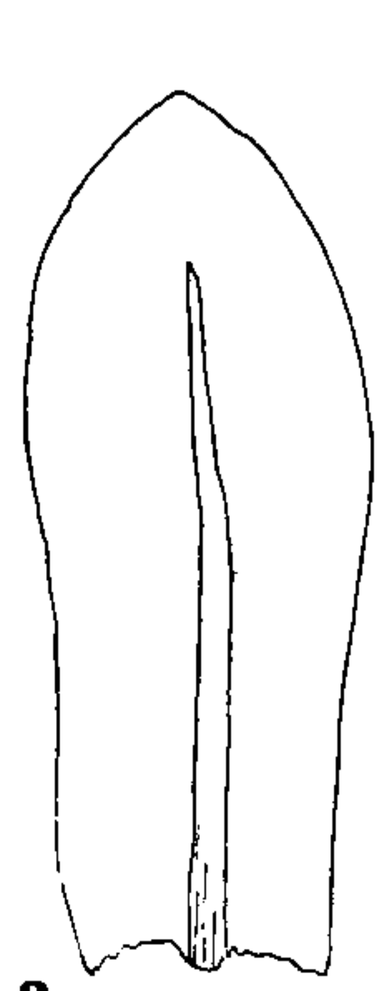
PLATE 172. PSEUDOPOHLIA BULBIFERA.

FIG. 1. Fruiting plant, about natural size. 2. Male plant, natural size. 3. Median cells of leaf, ×135 dia. 4. Apex of leaf, ×135 dia. 5. Stem-leaf, ×20 dia. 6. Capsule, ×10 dia. 7. Outer perichaetial leaf, ×20 dia. 8. Inner perichaetial leaf, ×20 dia. 9. Median exothecal cells, ×135 dia. 10. Bulblet, ×135 dia. 11. Stomata and cells of the neck, ×135 dia. 12. Peristome and annulus, ×135 dia. 13. Inner face of the teeth showing the separated plates, ×135 dia.

PLATE 173. STEREODONTOPSIS FLAGELLIFERA.

FIG. 1. Plant, about natural size. 2. Stem-leaf, ×30 dia. 3. Apex of perichae-

1



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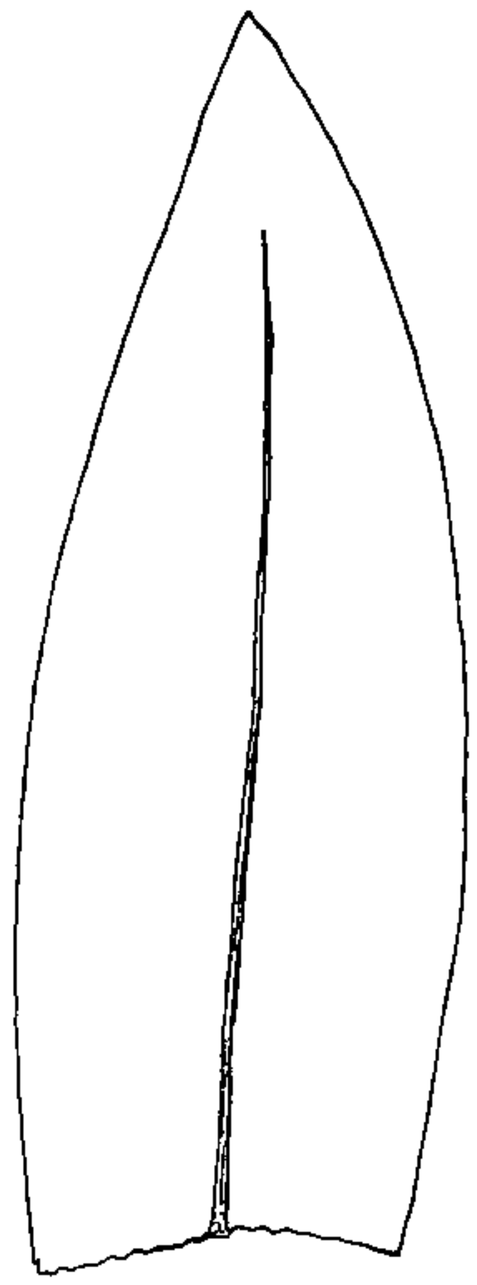

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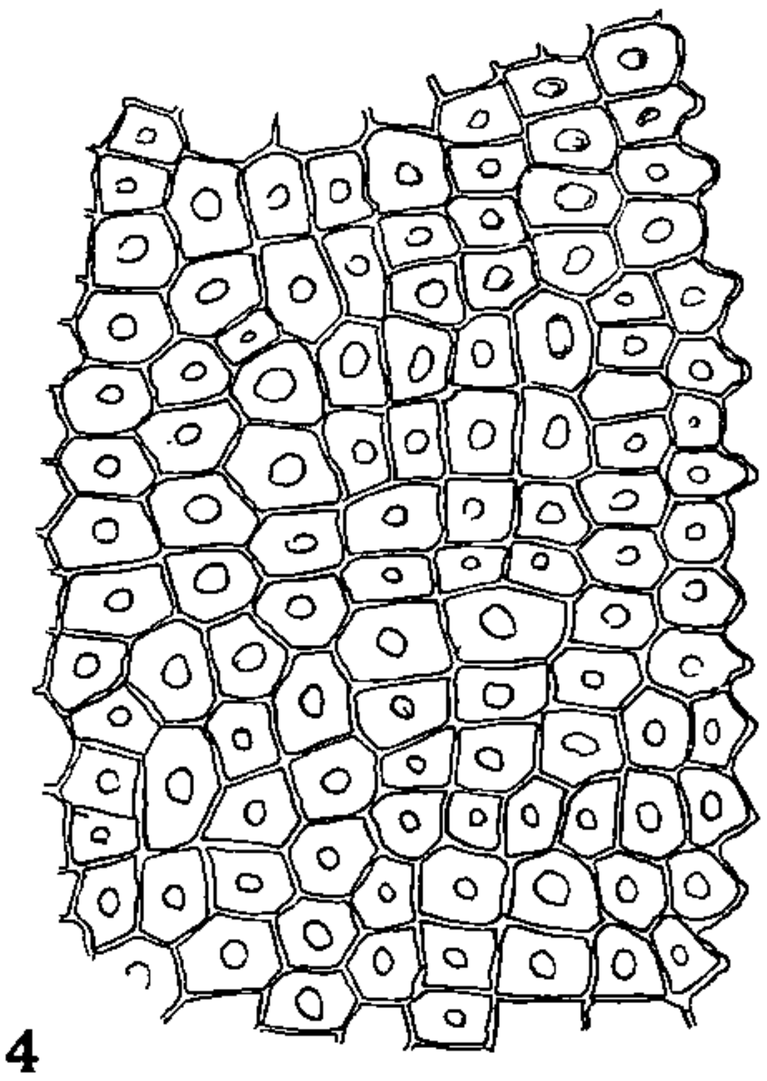

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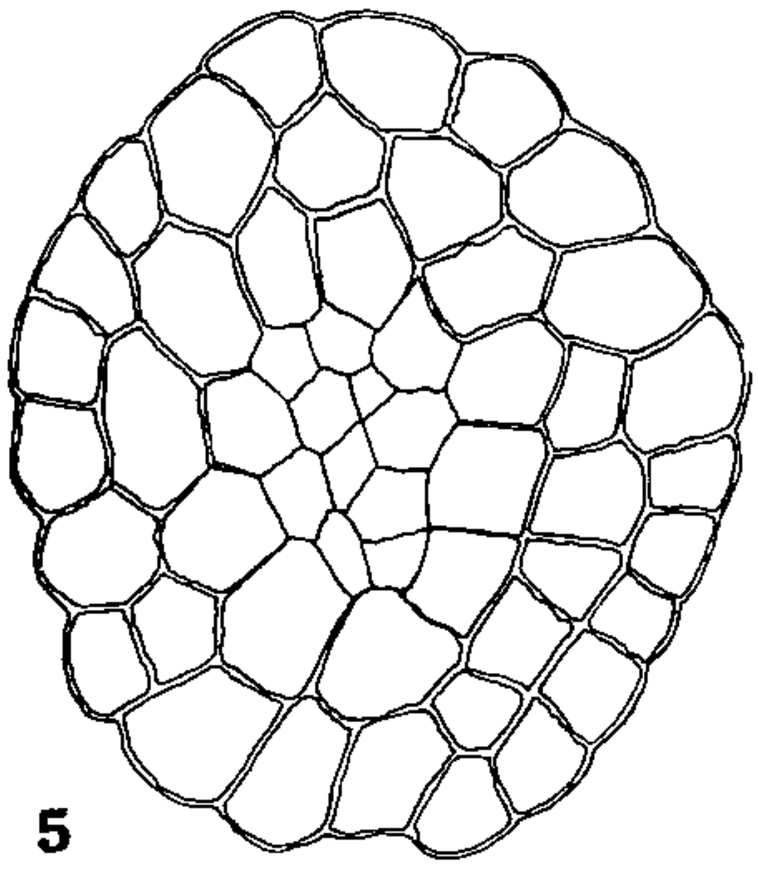

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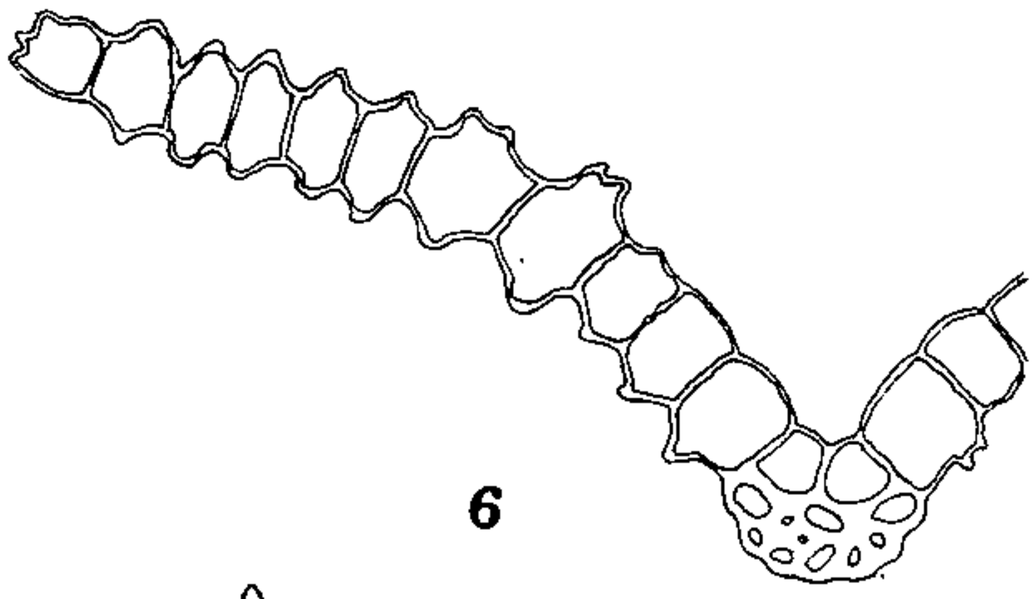

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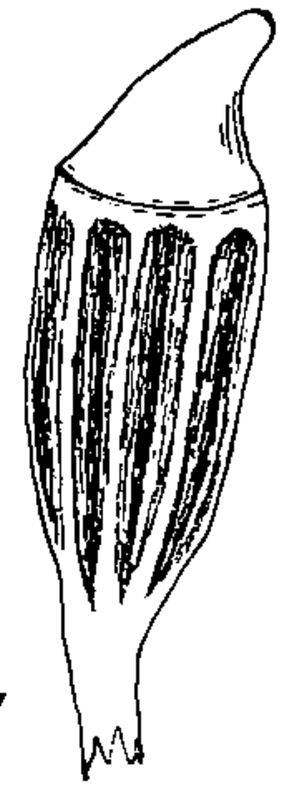

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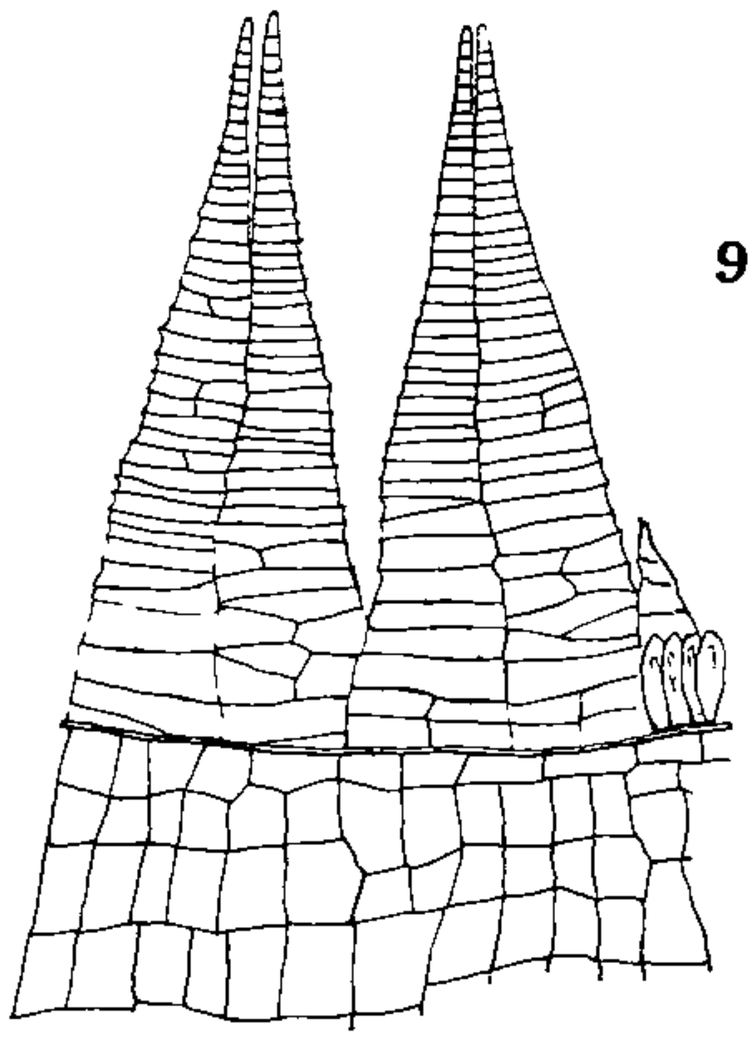

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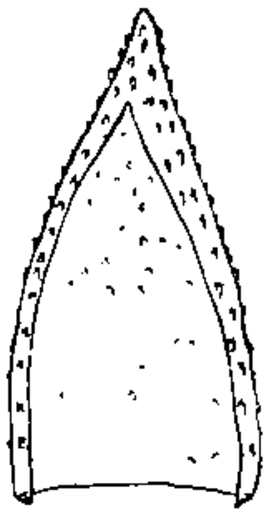

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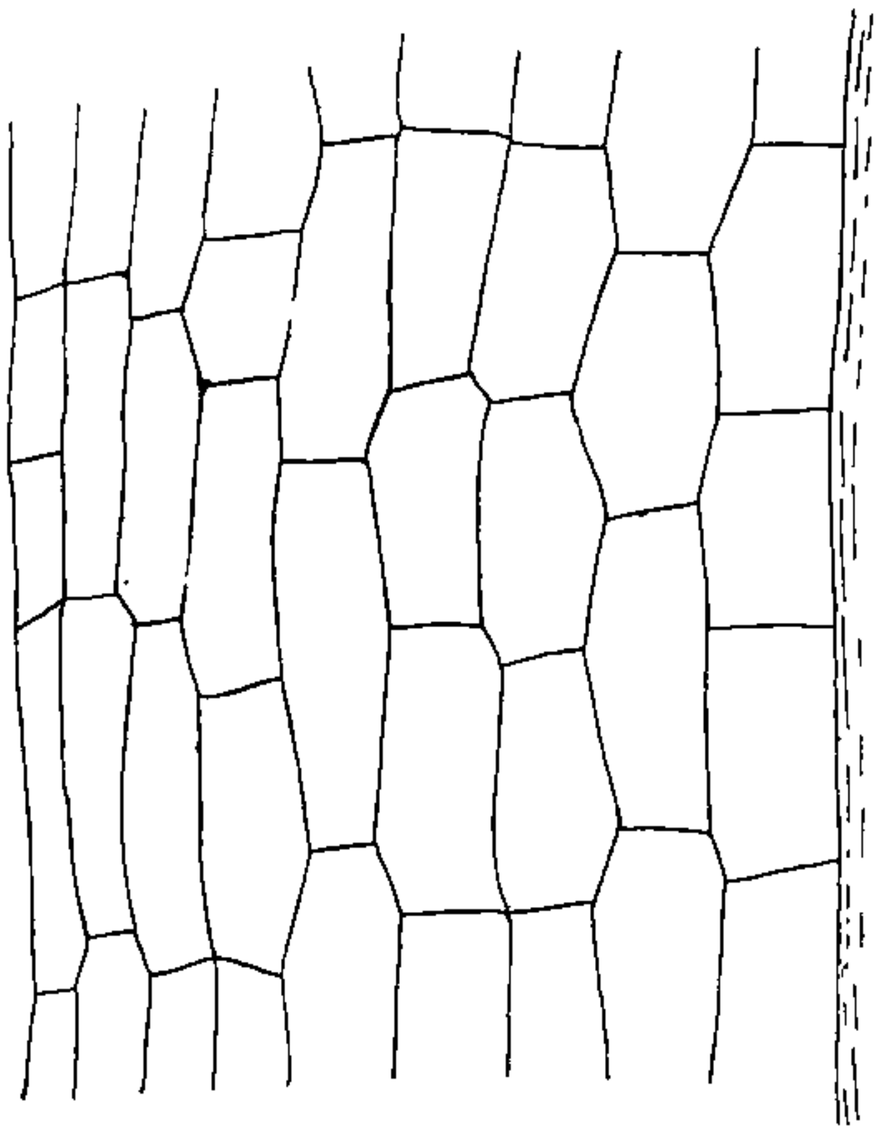

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RHABDOWEISIELLA PAPILLOSA R. S. WILLIAMS

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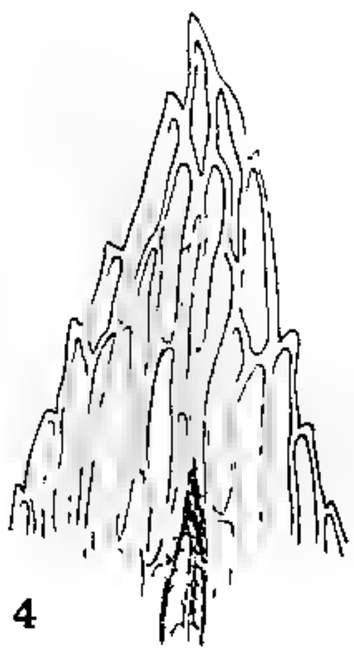

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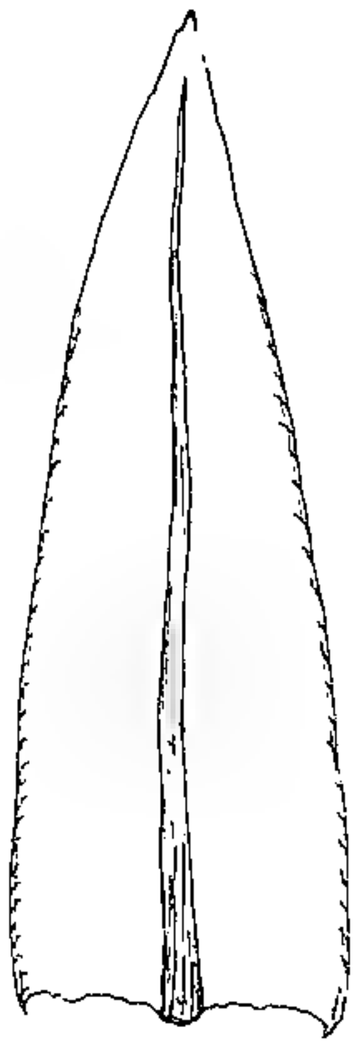

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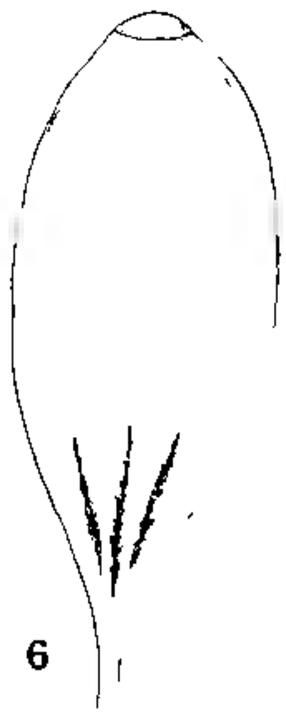

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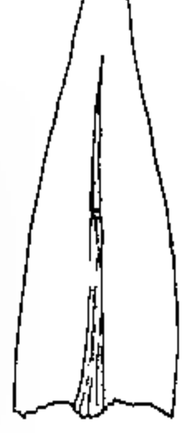

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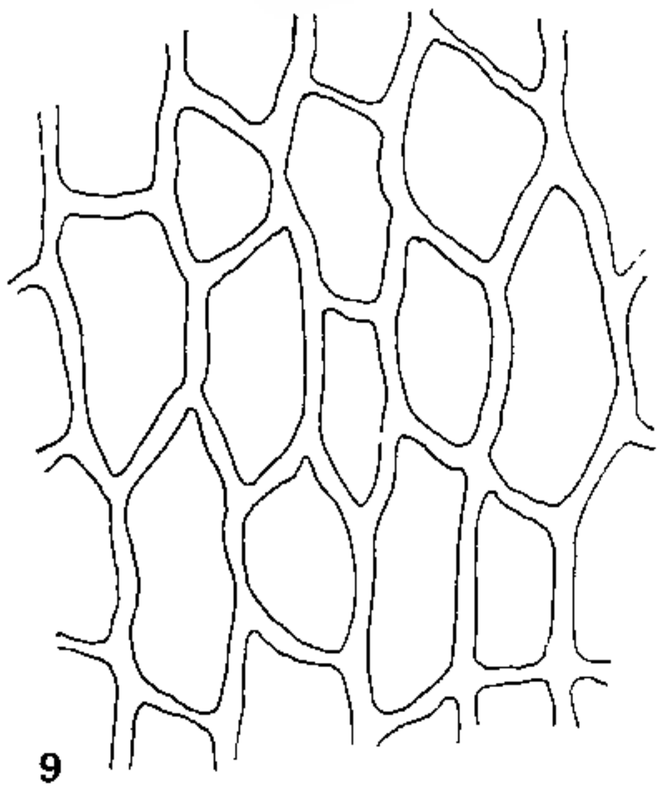

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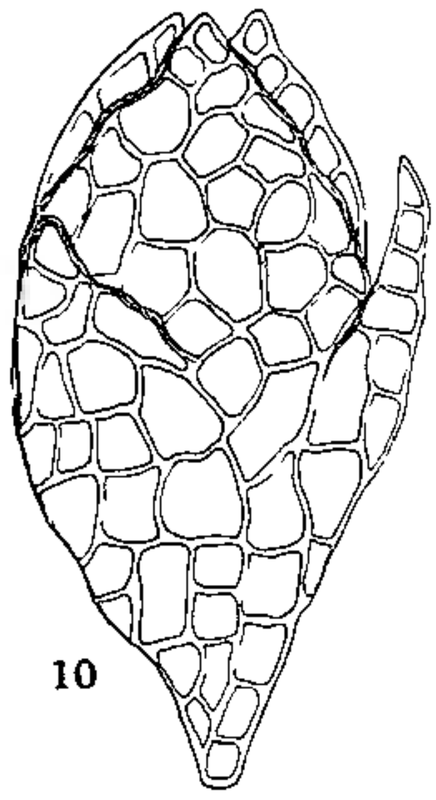

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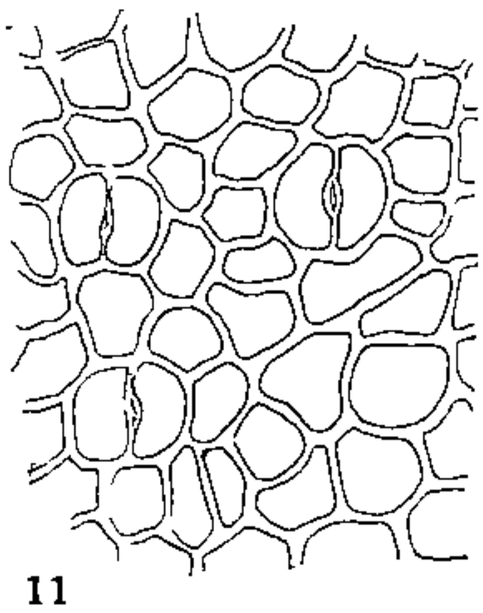

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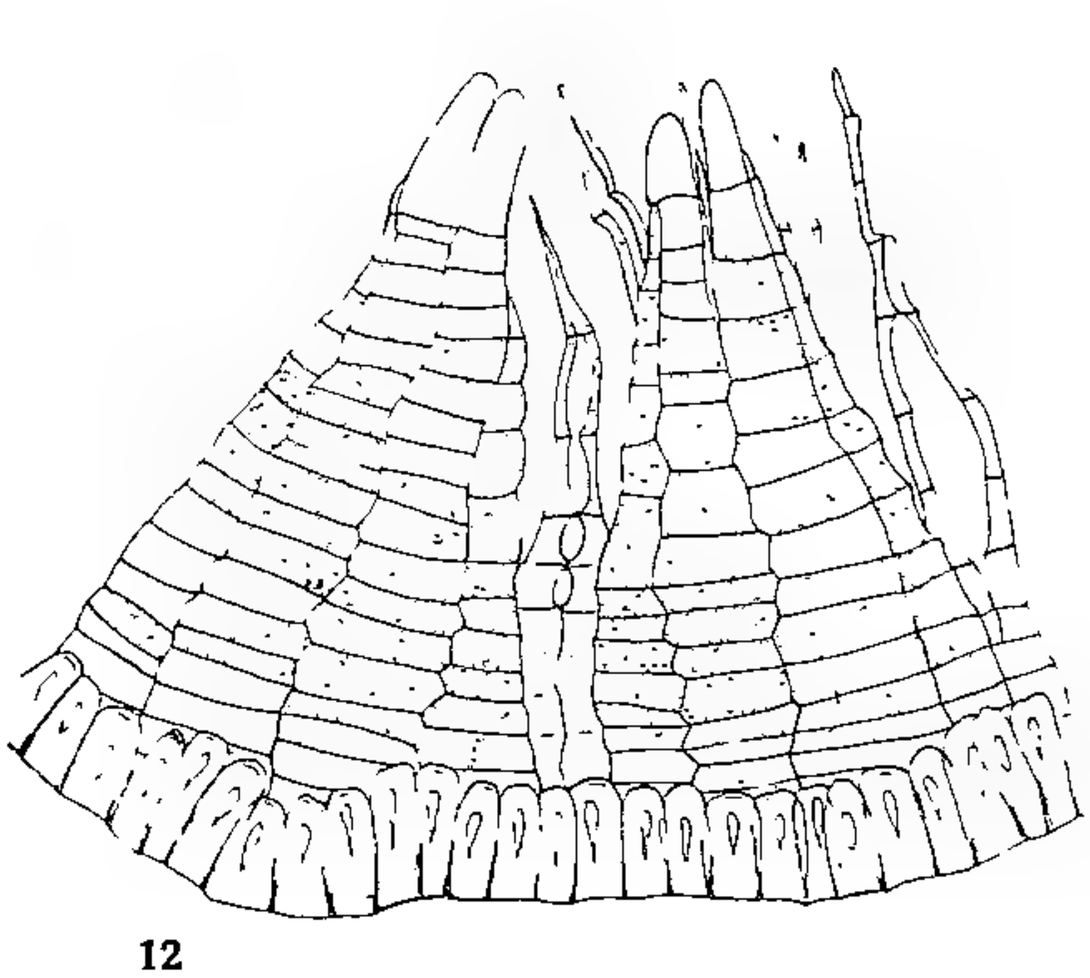

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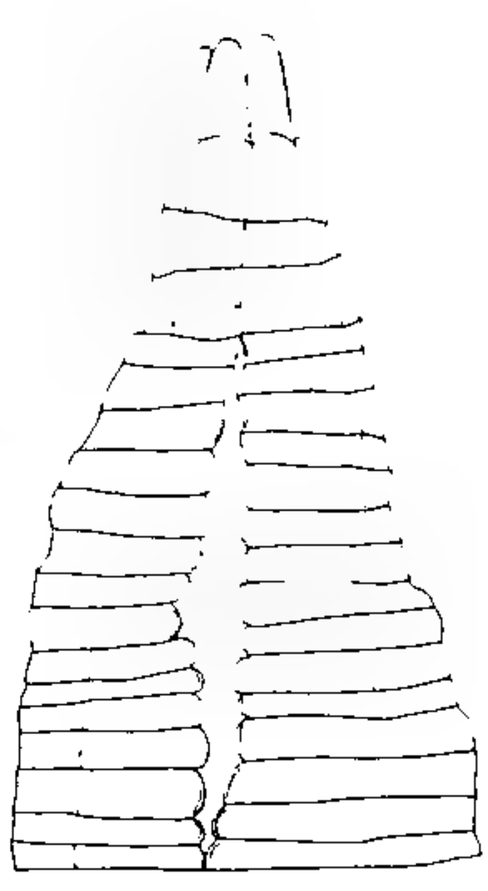

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PSEUDOPOHLIA BULBIFERA R. S. WILLIAMS

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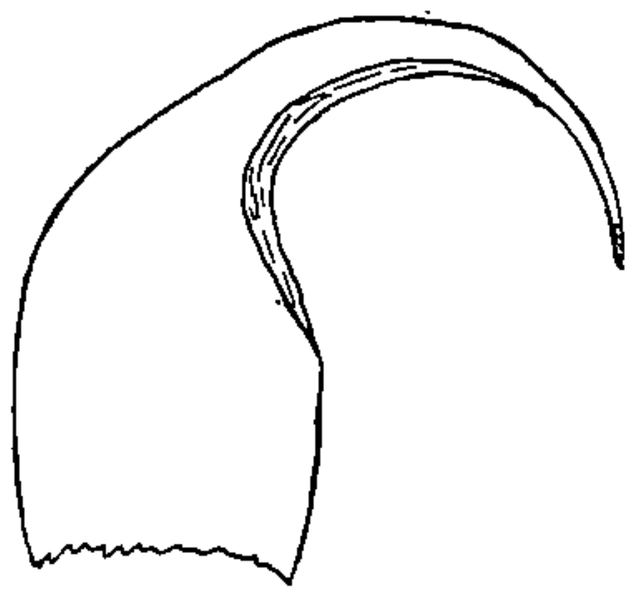

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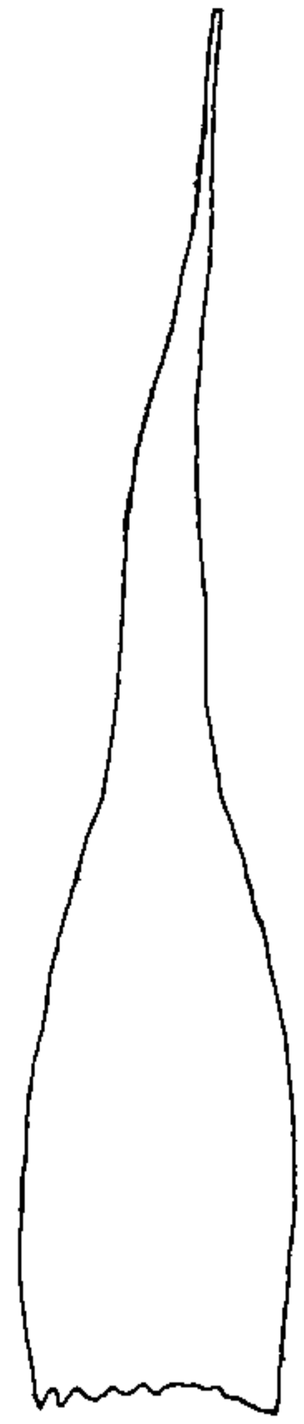

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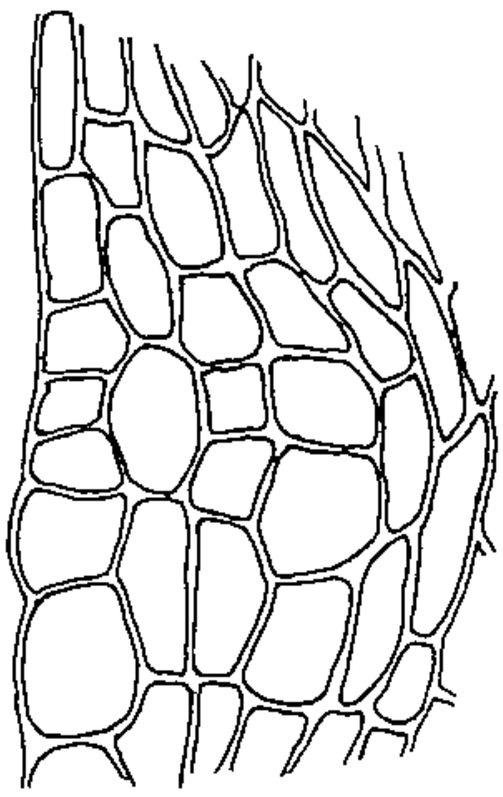

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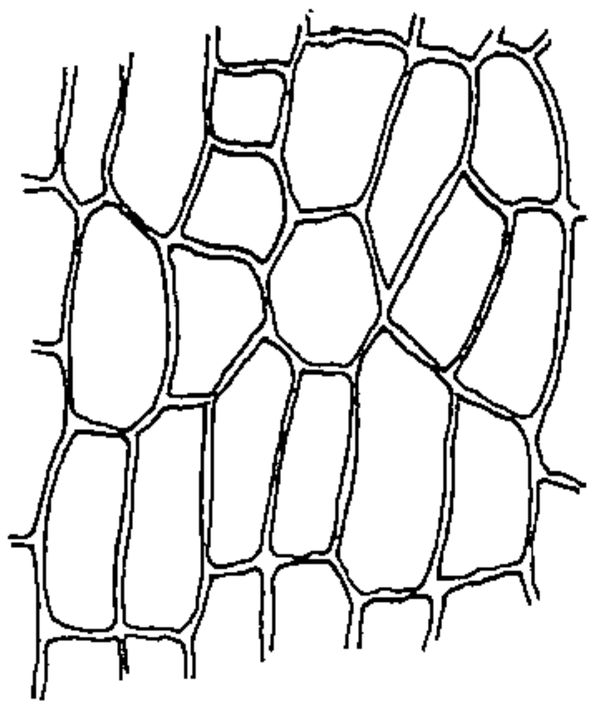

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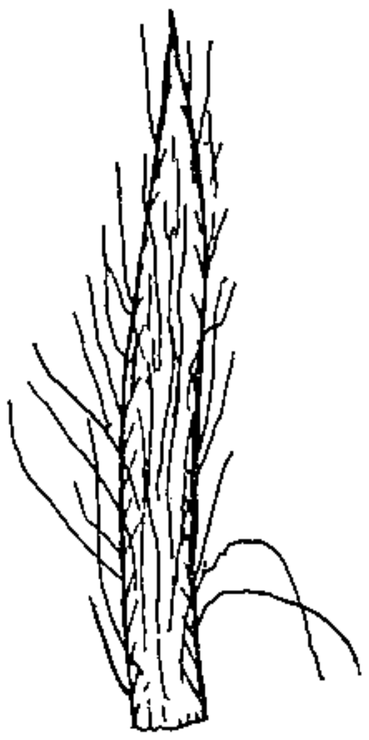

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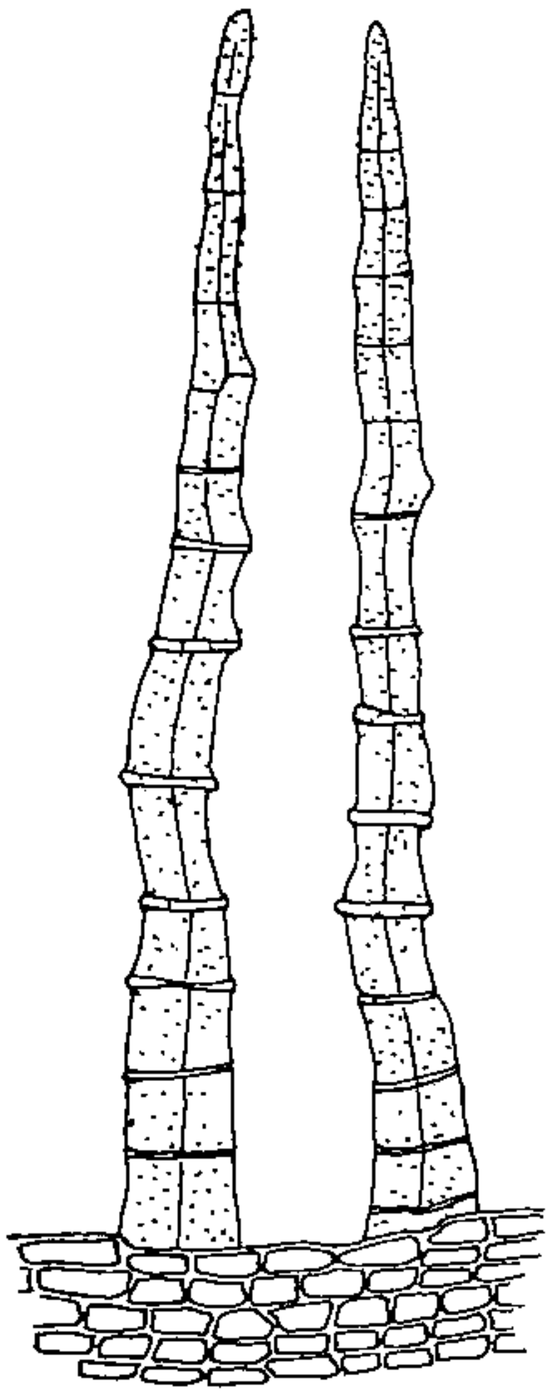

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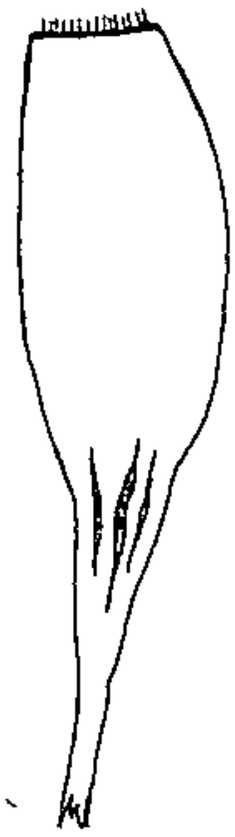

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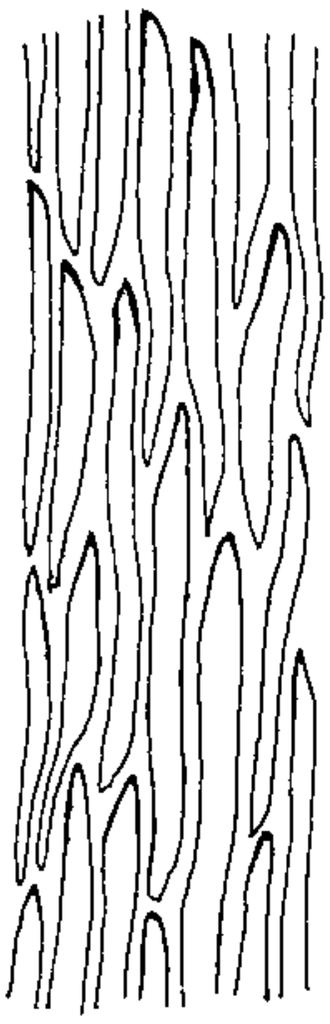

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STEREODONTOPSIS FLAGELLIFERA R. S. WILLIAMS

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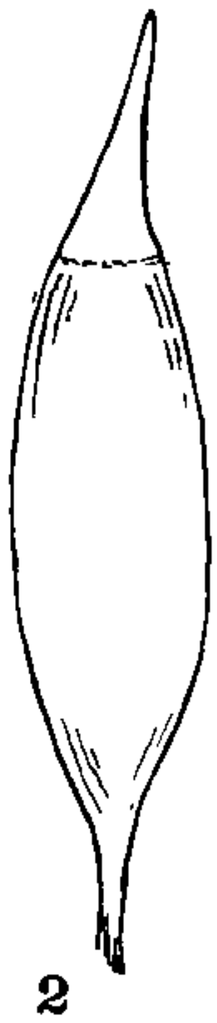

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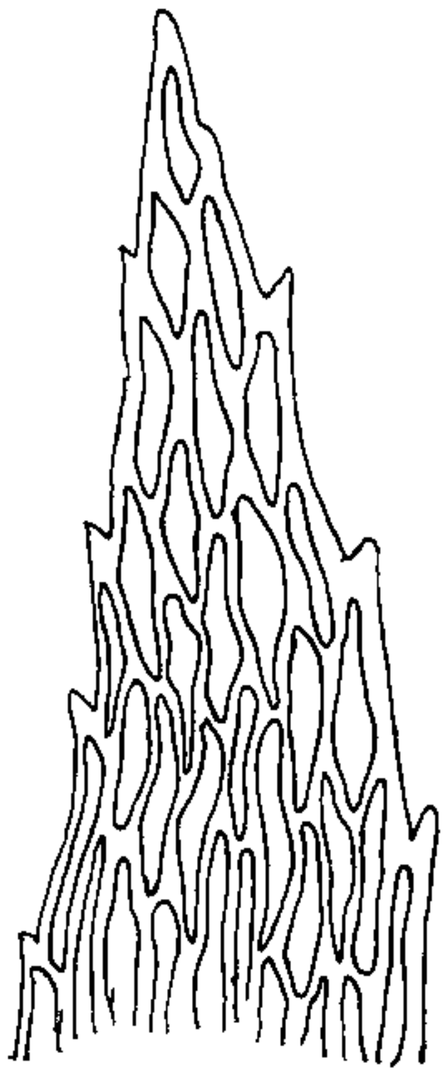

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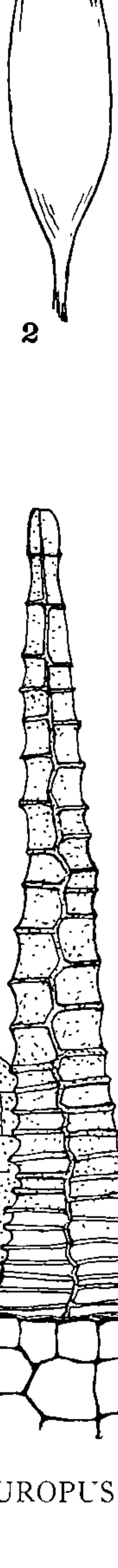

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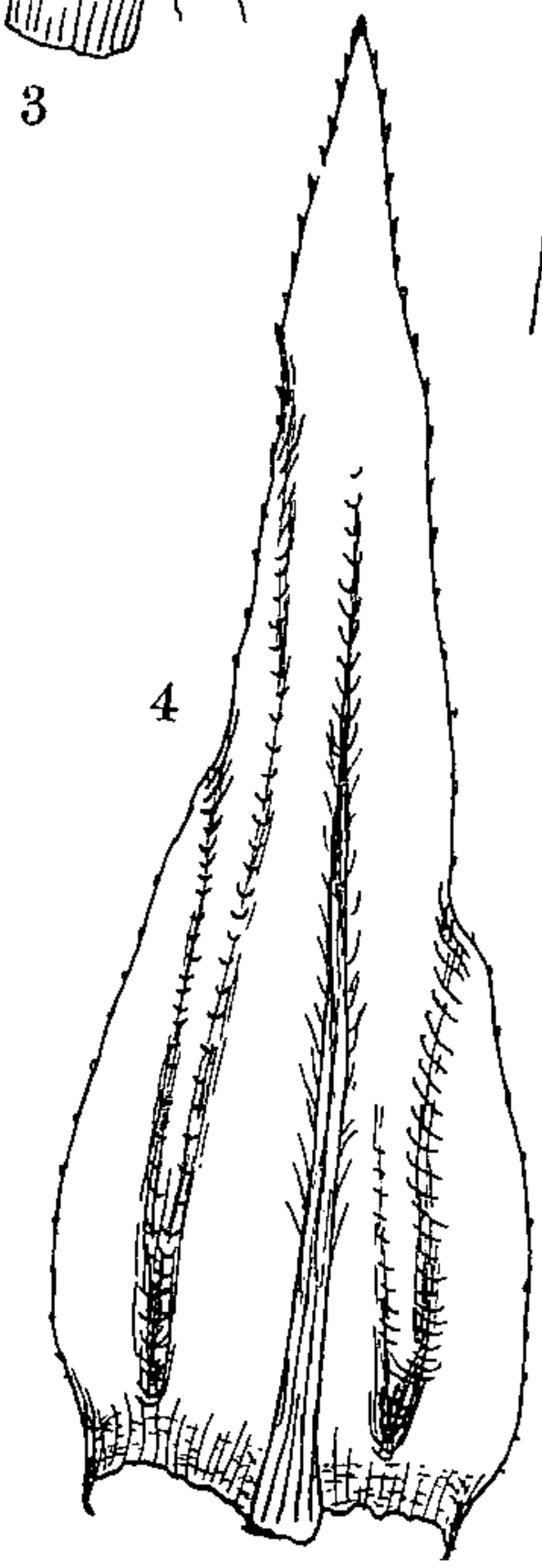

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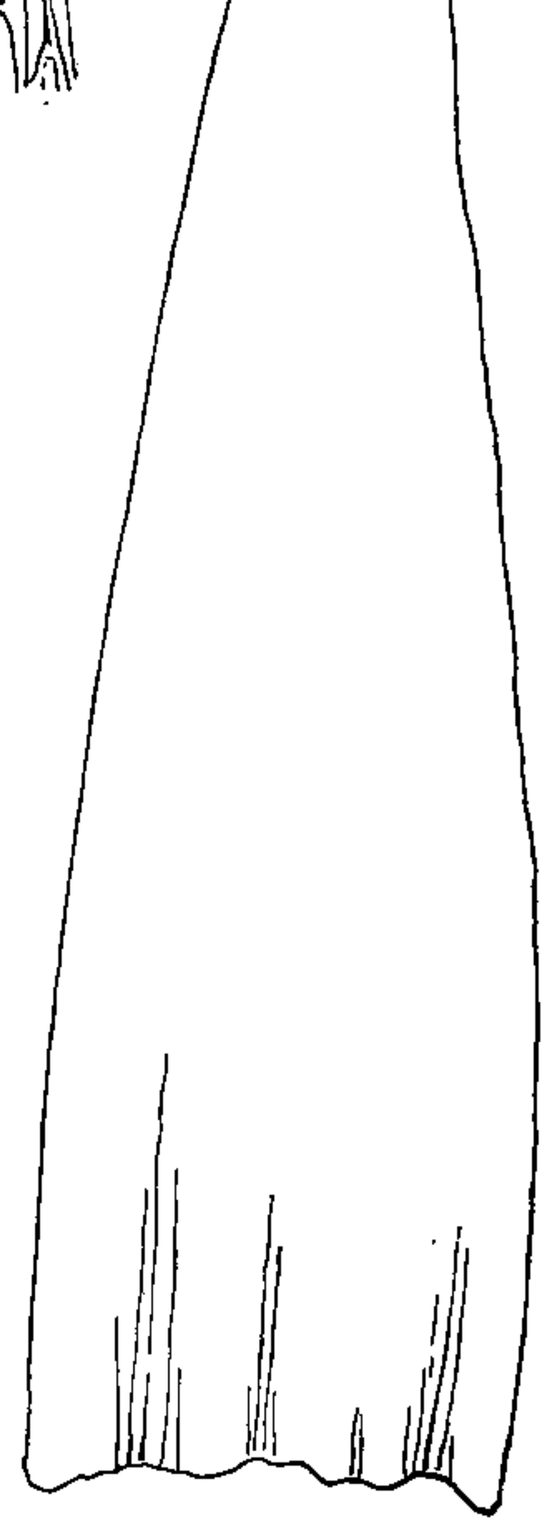

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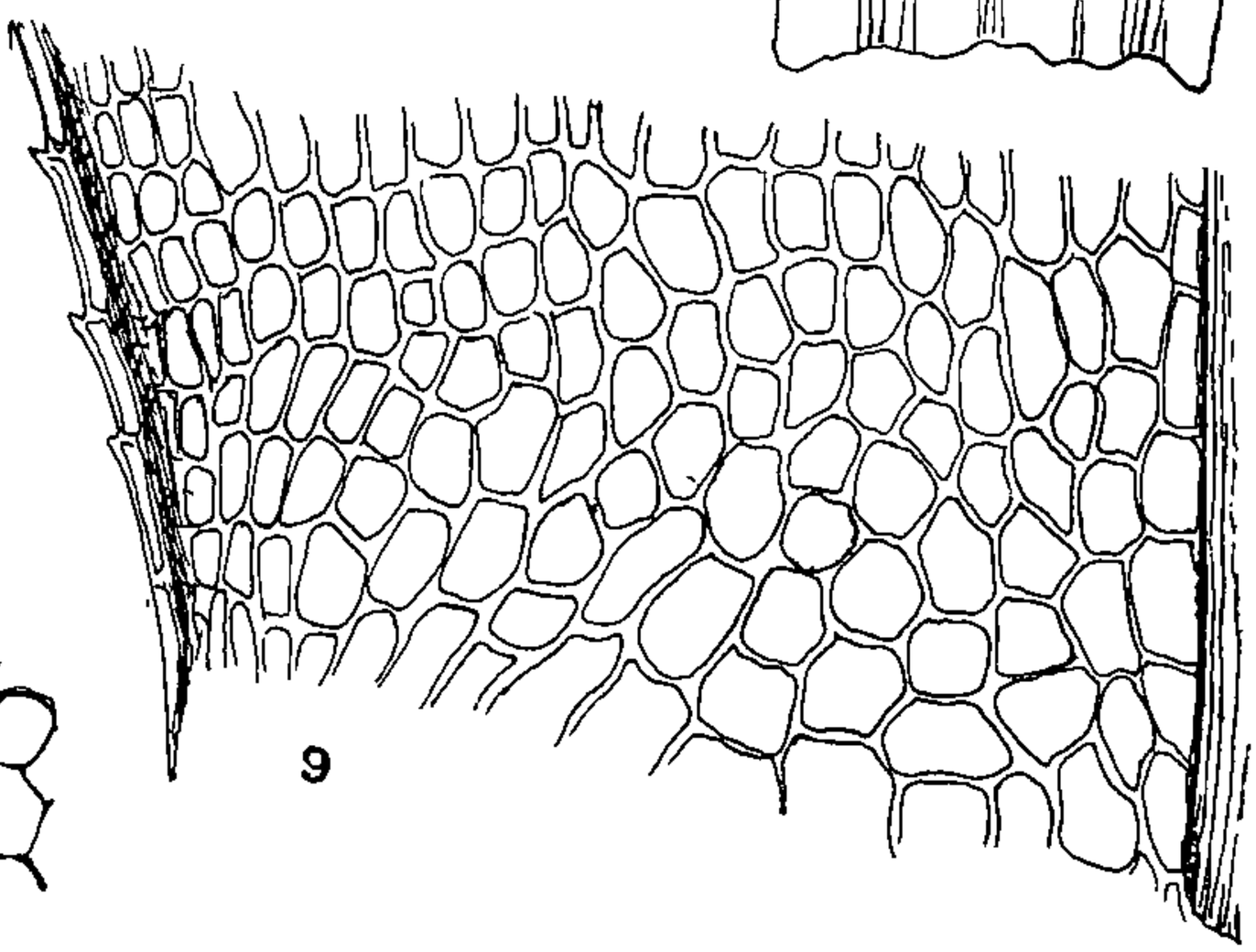

9

PLEUROPUS APPRESSIFOLIUS R. S. WILLIAMS

tial leaf, ×270 dia. 4. Inner perichaetial leaf, ×30 dia. 5. Alar cells, ×270 dia. 6. Median exothecal cells, ×270 dia. 7. Calyptra, ×12 dia. 8. Part of peristome and rim of capsule, ×270 dia. 9. Capsule, ×16 dia. 10. Median cells of leaf, ×400 dia. 11. Apex of leaf, ×400 dia.

PLATE 174. PLEUROPUS APPRESSIFOLIUS.

FIG. 1. Plant, about natural size. 2. Capsule, ×12 dia. 3. Calyptra, ×12 dia. 4. Stem-leaf, ×45 dia. 5. Median cells of leaf, ×270 dia. 6. Apex of leaf, ×270 dia. 7. Inner perichaetial leaf, ×45 dia. 8. Part of peristome and rim of capsule, ×270 dia. 9. One side of base of leaf, ×270 dia.

CORRECTION

Page 358.

For *Calyptothecium tumidum* (Dicks.) Fl. read *Calyptothecium philippinense* Broth. The Philippine specimens are the same as those of Java, figured and described by Fleischer in Musci Fl. von Buitenzorg, p. 861–4, but they all differ from the true *C. tumidum* of Ceylon and India, the latter having leaves more crowded on the stems, not auriculate at the base and shorter, wider, less angular leaf-cells, as well as other differences.

The Vegetation of Vieques Island

By Percy Wilson

The island of Vieques is situated about seven miles southeast of the eastern end of Porto Rico, from which it is separated by the Vieques Passage. From Punta Arenas on the west to the eastern end, Vieques is about nineteen or twenty miles in length; its greatest width is about five miles.

"The greater part of the island is made up of a soft brown eruptive rock with occasional outcroppings of a harder bluish rock, very similar to the formation of the Virgin Islands lying to the eastward. Some of the larger peninsulas projecting from the south side and all that portion of the eastern end of the island that is separated from the main body by bays and salinas, are composed of a soft fossiliferous limestone.

"The surface is very hilly, often steep, but seldom precipitous. Few of the hills attain an altitude of over five hundred feet, the highest being Cerro Ventana on the southwestern end, where a height of one thousand one hundred and twenty-five feet was recorded by the aneroid barometer. The summits of these hills are rocky and covered for the most part with trees and shrubs; the sides are usually of good soil and under cultivation, or used for pasturing.

"The cultivation of sugar-cane has recently been carried on very extensively, so that at the present time the western two thirds of the island is practically all in cane from the seacoast to the rocky tops of the low hills. The eastern portion of the island is given over to pasturage, but most of it is at present being neglected and is growing into brush and thickets. This part is also much drier and more rocky and is densely wooded with small trees. Throughout the island there is little growth underneath the trees in the rocky forests."*

* J. A. Shafer. Botanical Exploration on the Island of Vieques, Porto Rico. Jour. N. Y. Bot. Gard. 15: 103–105. 1914.

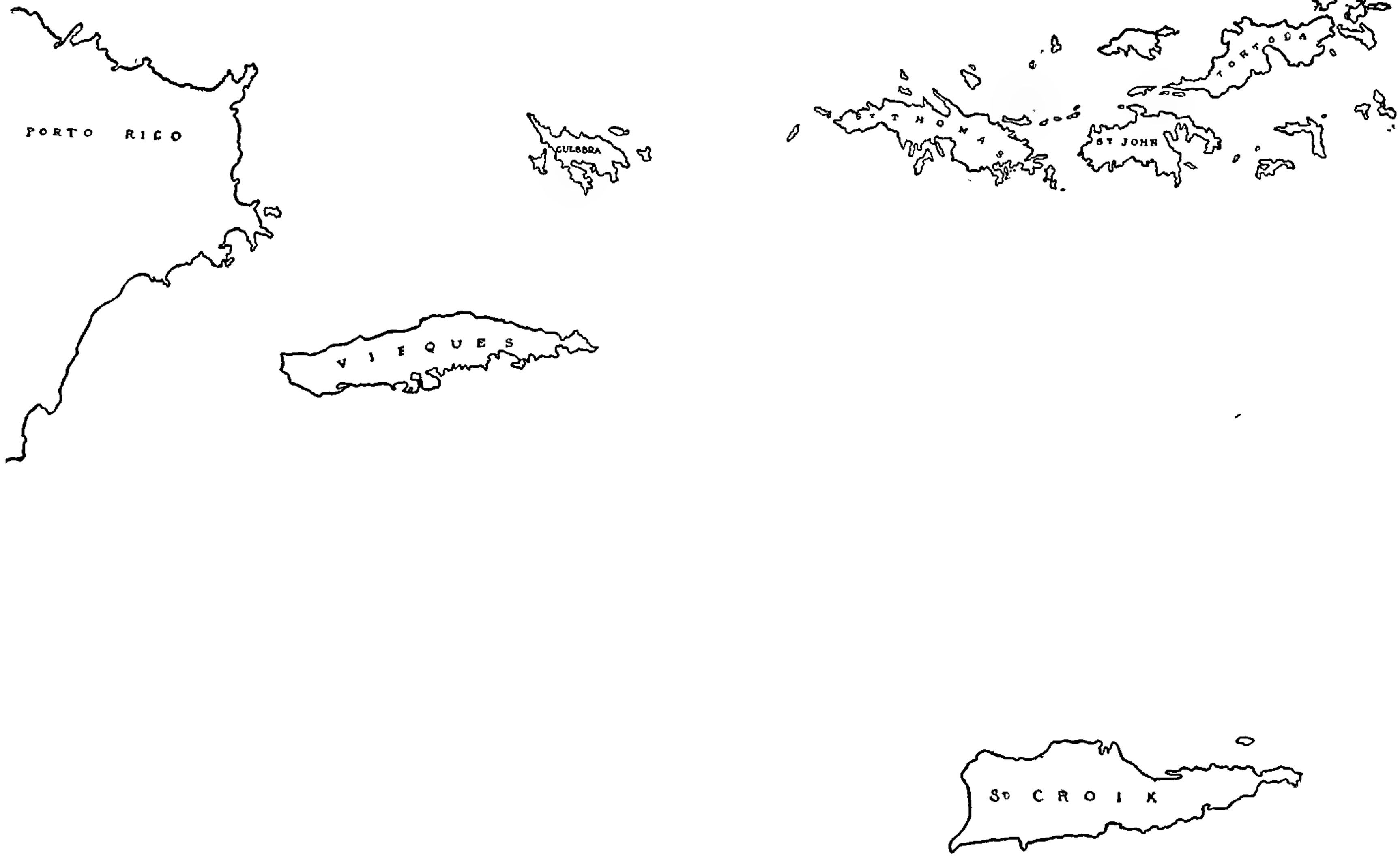

FIG. 1. Outline map showing position of Vieques.

The flora of Vieques, with its fewer species, is essentially similar to that of Porto Rico, yet there are a few elements in it which are not represented on the larger island. Of the cryptogams a more complete collection would undoubtedly add many species to those here recorded.

In the following list, based chiefly upon Dr. Shafer's collection, the habitat of each species is given as indicated on the labels of specimens collected on Vieques, which is sometimes at variance with the natural habitat of the plant. Comparison of the distribution of each species is made only with the adjacent islands of Porto Rico, Culebra, St. Thomas, and St. Croix, with an occasional reference to the smaller island of Culebrita.

Collectors

Labat, Jean-Baptiste, a French friar, visited Vieques between 1694 and 1705. There is no evidence that he made a collection of herbarium specimens.

West, Hans, principal of the school at Christianssted, St. Croix, from 1788 to 1800, made extensive collections on the islands of St. Thomas and St. Croix, and about 1797 visited Porto Rico and Vieques.

Ravn, Peter, a surgeon on the Island of St. Thomas, collected on Vieques some time between 1818 and 1839.

Blauner, Bernhard Friedrich, visited Vieques about 1853.

Grosourdy, René de, a French physician and chemist, collected on Vieques before 1864.

Eggers, Heinrich Franz Alexander von, made extensive collections in the West Indies between 1870 and 1899. His specimens from Vieques were probably obtained about 1882.

More detailed accounts of the foregoing collectors will be found in volumes 1 and 3 of Urban's Symbolae Antillanae. Herbarium specimens of most of the earlier collections are to be found at the Botanical Museum at Copenhagen, Denmark.

CHASE, AGNES, Assistant Systematic Agrostologist, U. S. Department of Agriculture, was on Vieques November 28–30, 1913. A collection of grasses was made in the western half of the island.

SHAFER, JOHN ADOLPH, explored Vieques from January 23 to March 2, 1914. A collection, including lichens, hepatics, fungi, mosses, ferns, and flowering plants, and embracing over seven hundred field numbers, was made on this expedition. It is preserved in the herbarium of the New York Botanical Garden.

LIST OF SPECIES OCCURRING ON VIEQUES ISLAND

MONOCOTYLEDONS

TYPHACEAE

Typha angustifolia L.

Wet places: Porto Rico, St. Thomas, St. Croix.

ZANNICHELLIACEAE

?Ruppia maritima L. (Sterile.)

In water: Porto Rico, Culebra, St. Thomas, St. Croix.

POACEAE

Coix Lachryma-Jobi L.

Wet ravines: Porto Rico; cult. in St. Thomas and St. Croix.

Saccharum officinarum L.

Cultivated, sometimes escaping.

Cymbopogon citratus (DC.) Stapf.

Borders of trails: Porto Rico, St. Thomas.

Holcus Sorghum L.

Porto Rico, St. Thomas, St. Croix: Vieques according to Eggers.

Paspalum glabrum Poir.

Sandy and rocky soil near the coast: Porto Rico, Culebra, St. Thomas, St. Croix.

Paspalum millegranum Schrad.

Wet places: Porto Rico.

Paspalum virgatum L.

Waste and cultivated grounds: Porto Rico.

Paspalum fimbriatum H. B. K.

Moist ground: Porto Rico, St. Croix.

Paspalum conjugatum Berg.

Fields and hillsides: Porto Rico.

Paspalum distichum L.

Wet ground along the coast: Porto Rico.

Paspalum vaginatum Sw.

Seashores: Porto Rico.

Syntherisma digitatum (Sw.) Hitchc.
Hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.
Syntherisma sanguinale (L.) Dulac.
Waste and cultivated grounds: Porto Rico, St. Croix.
Anastrophus compressus (Sw.) Schlecht.
Roadsides: Porto Rico, St. Thomas, St. Croix.
Valota insularis (L.) Chase.
Hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.
Echinochloa colona (L.) Link.
Hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.
Panicum barbinode Trin.
Wet places: Porto Rico, Culebra.
Panicum reptans L.
Dry hilltops: Porto Rico, St. Thomas, St. Croix.
Panicum fasciculatum Sw.
Moist hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.
Panicum adspersum Trin.
Roadside embankments: Porto Rico, St. Croix.
Panicum maximum Jacq.
Borders of cane-fields: Porto Rico, Culebra, St. Thomas, St. Croix.
Panicum laxum Sw.
Roadside ditches and ravines: Porto Rico, St. Thomas.
Lasiacis divaricata (L.) Hitchc.
Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.
Lasiacis Swartziana Hitchc.
Thickets: Porto Rico.
Oplismenus setarius (Lam.) R. & S.
Ravines and woods: Porto Rico, St. Thomas, St. Croix.
Chaetochloa setosa (Sw.) Scribn.
Dry rocky woods: Porto Rico, St. Thomas, St. Croix.
Cenchrus viridis Spreng.
Moist ground: Porto Rico, Culebra, St. Thomas.
Cenchrus echinatus L.
Hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.
Cenchrus carolinianus Walt.
Sandy shores: Porto Rico, St. Thomas.
Stenotaphrum secundatum (Walt.) Kuntze.
Marshes: Porto Rico, St. Thomas, St. Croix.
Olyra latifolia L.
Woodlands: Porto Rico, St. Thomas.
Pharus glaber H. B. K.
Rocky woods: Porto Rico, St. Thomas, St. Croix.
Sporobolus virginicus (L.) Kunth.
Coastal sands: Porto Rico, St. Thomas, St. Croix.
Sporobolus indicus (L.) R. Br.
Sandy soil: Porto Rico.
Sporobolus angustus Buckley.
Cane-fields: Porto Rico, St. Thomas, St. Croix.

Spartina juncea (Michx.) Willd.
Coastal rocks and beaches: Porto Rico.
Chloris paraguaiensis Steud.
Dry hills: Porto Rico, Culebra, St. Thomas, St. Croix.
Chloris radiata (L.) Sw.
Roadsides: Porto Rico, St. Thomas, St. Croix.
Eustachys petraea (Sw.) Desv.
Sandy places: Porto Rico.
Bouteloua americana (L.) Scribn.
Roadsides: Porto Rico, St. Thomas, St. Croix.
Eleusine indica (L.) Gaertn.
Coastal sands: Porto Rico, St. Thomas, St. Croix.
Dactyloctenium aegyptium (L.) Willd.
Borders of trails: Porto Rico, St. Thomas, St. Croix.
Leptochloa virgata (L.) Beauv.
Waste ground and ditches: Porto Rico, Culebra, St. Croix.
Arundo Donax L.
Borders of thickets: Porto Rico.
Eragrostis tephrosanthes Schult.
Yards: Porto Rico, St. Thomas, St. Croix.
Eragrostis ciliaris (L.) Link.
Hillsides and borders of thickets: Porto Rico, Culebrita, St. Thomas, St. Croix.
Uniola virgata (Poir.) Griseb.
Dry lime-rock thickets and edges of limestone cliffs: Porto Rico, St. Thomas.
Arthrostylidium capillifolium Griseb.
Woods: Porto Rico, St. Thomas.

Cyperaceae

Cyperus surinamensis Rottb.
Roadside ditches: Porto Rico, St. Thomas.
Cyperus sphacelatus Rottb.
Moist soil and on hillsides: Porto Rico, St. Thomas.
Cyperus compressus L.
Moist soil or dry hillsides: Porto Rico, Culebra.
Cyperus rotundus L.
Roadside ditches and cane-fields: Porto Rico, St. Thomas, St. Croix.
Cyperus Urbani Boeckl.
Shade in woods: Porto Rico.
Cyperus ligularis L.
Coastal sands: Porto Rico, Culebra, St. Thomas, St. Croix.
Cyperus brunneus Sw.
Borders of coastal thickets: Porto Rico, St. Thomas, St. Croix.
Cyperus planifolius L. C. Rich.
Hillsides and borders of coastal thickets: Porto Rico, Culebra, St. Thomas.
Cyperus ferax L. C. Rich.
Roadside ditches: Porto Rico, Culebra, St. Thomas, St. Croix.
Eleocharis capitata (L.) R. Br.
Wet sand and fresh-water ditches: Porto Rico, St. Thomas, St. Croix.

Eleocharis mutata (L.) R. & S.
Wet grounds: Porto Rico, Culebra, St. Croix.
Fimbristylis diphylla (Retz.) Vahl.
Moist hillsides: Porto Rico, St. Thomas, St. Croix.
Fimbristylis ferruginea (L.) Vahl.
Salt marshes and coastal sands near mangrove swamps: Porto Rico, Culebra, St. Thomas, St. Croix.
Dichromena ciliata Vahl.
Moist fields: Porto Rico, St. Thomas.
Scleria lithosperma (L.) Sw.
Shaded rocks in ravines: Porto Rico, St. Thomas, St. Croix.

ARECACEAE

Phoenix dactylifera L.
Dry pastures: Porto Rico.
Coccothrinax argentea (Lodd.) Sargent.
Hillsides: Culebra, St. Thomas.
Thrinax ponceana O. F. Cook.
Limestone thickets: Porto Rico.
Roystonea caribaea (Spreng.) P. Wilson. (*Euterpe caribaea* Spreng.; *Roystonea Borinquena* O. F. Cook; *Oreodoxa caribaea* Damm. & Urban.)
Wet ravines: Porto Rico.

ARACEAE

Anthurium acaule (Jacq.) Schott.
Ravines: Porto Rico, Culebra, St. Thomas.
Philodendron giganteum Schott.
On rocks: Porto Rico; St. Thomas according to Eggers.
Dieffenbachia Seguine (Jacq.) Schott.
Wet ravines: Porto Rico; St. Thomas according to Eggers.
Leaves of an aroid, apparently a species of *Xanthosoma*, were collected in a wet ravine between Playa Grande and La Mina, *Shafer 3009*.

BROMELIACEAE

Bromelia Pinguin L.
Thickets and fence-rows: Porto Rico, St. Thomas, St. Croix.
Pitcairnia angustifolia (Sw.) Redouté.
On rocks: Porto Rico, St. Thomas, St. Croix.
Tillandsia utriculata L.
On rocks and trees: Porto Rico, Culebra, St. Thomas, St. Croix.
Tillandsia fasciculata Sw.
On trees and rocks: Porto Rico, St. Thomas.
Tillandsia sublaxa Baker.
On bushes: Porto Rico.
Wittmackia lingulata (L.) Mez.
On rocks in ravines: Porto Rico, Culebra, St. Thomas.

COMMELINACEAE

Commelina longicaulis Jacq. (*Commelina nudiflora* of authors, not L.)
Wet ground: Porto Rico, Culebra, St. Thomas, St. Croix.

Commelina elegans H. B. K.

Roadside banks and shaded places: Porto Rico, St. Thomas, St. Croix.

Tradescantia geniculata Jacq.

Rocky woods: Porto Rico.

Callisia repens L.

Shaded places: Porto Rico, Culebra, St. Thomas, St. Croix.

Liliaceae

Aloe vera L.

Dry hills: Porto Rico, St. Thomas, St. Croix.

Sansevieria guineensis (Jacq.) Willd.

Ravines: Porto Rico, St. Thomas, St. Croix.

Smilacaceae

Smilax coriacea Spreng.

Limestone thickets: Porto Rico, St. Thomas, St. Croix.

Amaryllidaceae

Hymenocallis expansa Herb.

Coastal sands: Porto Rico, Culebra, St. Thomas, St. Croix.

Agave portoricensis Trelease.

Dry rocky hillsides: Porto Rico, Culebra.

Furcraea tuberosa Ait. f.

Coastal cliffs: Porto Rico, Culebra, St. Croix.

Dioscoreaceae

Rajania cordata L.

Rocky woods: Porto Rico, St. Thomas.

Zingiberaceae

Alpinia occidentalis Sw.

Woods: Porto Rico, St. Thomas, St. Croix.

Orchidaceae

Vanilla Eggersii Rolfe.

Dense woods: Porto Rico, St. Thomas.

Epidendrum papilionaceum Vahl.

On trees: Porto Rico, Culebra, St. Thomas, St. Croix.

Epidendrum ciliare L.

On trees, rocks or cliffs: Porto Rico, Culebra, St. Thomas, St. Croix.

Epidendrum cochleatum L.

On rocks: Porto Rico, St. Croix.

Oncidium variegatum Sw.

On trees in ravines: Porto Rico, St. Thomas, St. Croix.

Imperfect specimens of a terrestrial orchid were collected in woods at Martineau, *Shafer 3040*.

DICOTYLEDONS

Piperaceae

Piper medium Jacq.

Borders of rocky woods: Porto Rico, St. Thomas, St. Croix.

Piper aduncum L.

Damp ground: Porto Rico.

Peperomia glabella (Sw.) A. Dietr.

On trees and rocks: Porto Rico, St. Thomas.

Peperomia pellucida (L.) H. B. K.

In shade in crevices of walls: Porto Rico, St. Thomas, St. Croix.

Peperomia magnoliaefolia (Jacq.) A. Dietr.

On rocks in woods: Porto Rico, St. Thomas, St. Croix.

Peperomia humilis (Vahl) A. Dietr.

On rocks in woods and faces of cliffs: Porto Rico, St. Thomas, St. Croix.

?Peperomia Hamiltoniana Miq. (Sterile.)

Cliffs: St. Croix.

Ulmaceae

Momisia iguanaea (Jacq.) Rose & Standley.

Rocky woods: Porto Rico, Culebra, St. Thomas, St. Croix.

Moraceae

Chlorophora tinctoria (L.) Gaud.

Hillsides: Porto Rico, St. Thomas, St. Croix.

Ficus crassinervia Desf.

Rocky woods: Porto Rico, St. Thomas; St. Croix, according to Eggers.

Ficus laevigata Vahl.

Thickets and hillsides; sometimes used for fencing: Porto Rico, Culebra, St. Thomas, St. Croix.

Cecropia peltata L.

Open ravines: Porto Rico, St. Thomas, St. Croix.

Urticaceae

Fleurya aestuans (L.) Gaud.

Damp walls in shade: Porto Rico, St. Thomas, St. Croix.

Pilea microphylla (L.) Liebm.

On rocks and at the base of cliffs: Porto Rico, St. Thomas, St. Croix.

Pilea nummularifolia (Sw.) Wedd.

Shaded rocks: Porto Rico, St. Thomas, St. Croix.

?Pouzolzia occidentalis (Liebm.) Wedd.

Ravines: Porto Rico.

Loranthaceae

Dendropemon caribaeus Krug & Urban.

On trees: Porto Rico, St. Thomas, St. Croix.

Polygonaceae

Antigonum leptopus H. & A.

Thickets: Porto Rico.

Coccolobis Krugii Lindau.

Thickets: Porto Rico.

Coccolobis obtusifolia Jacq.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Coccolobis diversifolia Jacq.

Coastal thickets: Porto Rico, St. Thomas, St. Croix.

Coccolobis laurifolia Jacq.

Thickets: Porto Rico, St. Croix.

Coccolobis Uvifera (L.) Jacq.

Coastal thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Coccolobis nivea Jacq.

Moist ground: Porto Rico, St. Thomas, St. Croix.

Chenopodiaceae

Chenopodium ambrosioides L.

Waste places: Porto Rico, St. Croix.

Atriplex pentandra (Jacq.) Standley.

Sea-beaches: Porto Rico, St. Thomas, St. Croix.

Amaranthaceae

Celosia nitida Vahl.

Cliffs: Porto Rico, Culebra, St. Thomas, St. Croix.

Celosia virgata Jacq.

Thickets.

Amaranthus crassipes Schl.

Prostrate on sand: Porto Rico, Culebra, St. Thomas, St. Croix.

Amaranthus dubius Mart.

Yards: Porto Rico, St. Thomas.

Amaranthus spinosus L.

Waste lands near the coast: Porto Rico, Culebra, St. Thomas, St. Croix.

Amaranthus viridis L.

Yards: Porto Rico.

Centrostachys indica (L.) Standley.

Fields: Porto Rico, Culebra, St. Thomas, St. Croix.

Achyranthes repens L.

Yards: Porto Rico, St. Thomas, St. Croix.

Iresine angustifolia Euphr.

Thickets and roadsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Philoxerus vermicularis (L.) R. Br.

Coastal sands: Porto Rico, St. Thomas, St. Croix.

Nyctaginaceae

Mirabilis Jalapa L.

Wet fields: Porto Rico, St. Thomas, St. Croix.

Pisonia subcordata Sw.

Thickets: Porto Rico, Culebrita, St. Thomas, St. Croix.

Pisonia aculeata L.

Thickets: Porto Rico, St. Thomas, St. Croix.

Boerhavia paniculata L. C. Rich.

Waste places: Porto Rico, St. Thomas, St. Croix.

Batidaceae

Batis maritima L.

Borders of salt marshes: Porto Rico, Culebra, St. Thomas, St. Croix.

Phytolaccaceae

Rivina humilis L.

Thickets and moist shady places: Porto Rico, St. Thomas, St. Croix.

Trichostigma octandrum (L.) H. Walt.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Petiveria alliacea L.

Wet fields: Porto Rico, St. Thomas, St. Croix.

Microtea debilis Sw.

Moist places in shade: Porto Rico, St. Thomas.

Aizoaceae

Mollugo verticillata L.

On cliffs: Porto Rico.

Sesuvium portulacastrum L.

Coastal sands: Porto Rico, St. Thomas, St. Croix.

Trianthema portulacastrum L.

Clay banks: Porto Rico, Culebra, St. Thomas, St. Croix.

Portulacaceae

Talinum paniculatum (Jacq.) Gaertn.

On rocks: Porto Rico, Culebra, St. Thomas, St. Croix.

Portulaca oleracea L.

Waste places and dry rocky cliffs: Porto Rico, St. Thomas, St. Croix.

Portulaca quadrifida L.

Hilltops: Porto Rico, St. Croix.

Nymphaeaceae

Nymphaea ampla parviflora has been recorded from Vieques by Eggers. This is probably *Castalia pulchella* (DC.) Britton.

Menispermaceae

Cissampelos Pareira L.

Thickets: Porto Rico, St. Thomas, St. Croix.

Annonaceae

Annona muricata L.

Moist hillsides: Porto Rico, St. Thomas, St. Croix.

Annona glabra L.

Near water: Porto Rico, St. Thomas, St. Croix.

Annona squamosa L.

Roadsides: Porto Rico, St. Thomas, St. Croix.

Annona reticulata L.

Pasture lands: Porto Rico, St. Thomas, St. Croix.

Lauraceae

Acrodiclidium salicifolium (Sw.) Griseb.

Hillsides and rocky woods: Porto Rico, St. Thomas, St. Croix.

Misanteca triandra (Sw.) Mez.

Ravines: Porto Rico.

Nectandra coriacea (Sw.) Griseb.

Woods: Porto Rico, St. Thomas, St. Croix.

Cassythaceae

Cassytha americana Nees.

Coastal thickets: Porto Rico, St. Thomas, St. Croix.

Papaveraceae

Argemone mexicana L.

Coastal sands: Porto Rico, St. Thomas, St. Croix.

Brassicaceae

Lepidium virginicum L.

Fields: Porto Rico, St. Thomas, St. Croix.

Cakile lanceolata (Willd.) O. E. Schulz.

Coastal sands: Porto Rico, Culebra, St. Thomas, St. Croix.

Brassica integrifolia (West) O. E. Schulz.

Roadsides: Porto Rico, Culebrita, St. Thomas, St. Croix.

Capparidaceae

Cleome gynandra L.

Coastal sands: Porto Rico, St. Thomas, St. Croix.

Cleome aculeata L.

About dwellings.

Capparis indica (L.) Fawc. & Rendle.

Coastal thickets: Porto Rico, St. Thomas, St. Croix.

Capparis baducca L.

Roadside banks: Porto Rico, Culebra, St. Thomas, St. Croix.

Capparis flexuosa L.

Thickets and coastal cliffs: Porto Rico, St. Thomas, St. Croix.

Capparis coccolobifolia Mart.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Capparis portoricensis Urban.

Hillsides: Porto Rico.

Morisonia americana L.

Rocky woods: Culebra, St. Thomas, St. Croix.

Moringaceae

Moringa Moringa (L.) Millsp.

Thickets: Porto Rico, St. Thomas, St. Croix.

Crassulaceae

Bryophyllum pinnatum (Lam.) Kurz.

On rocks: Porto Rico, St. Thomas, St. Croix.

Amygdalaceae

Chrysobalanus Icaco L.

Sandy thickets: Porto Rico, St. Thomas, St. Croix.

Mimosaceae

Inga laurina (Sw.) Willd.

Banks of streams: Porto Rico, St. Thomas, St. Croix.

Pithecolobium Unguis-Cati (L.) Mart.

Thickets and rocky hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Albizzia Lebbeck (L.) Benth.

Hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Calliandra portoricensis (Jacq.) Benth.

Porto Rico, Culebra; Vieques according to Eggers.

Acacia nudiflora Willd.

Low ground near mangrove swamps: Porto Rico, Culebra, St. Thomas.

Acacia riparia H. B. K.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Acacia macracantha H. & B.

Forming thickets: St. Thomas, St. Croix.

Vachellia Farnesiana (L.) Wight & Arn.

Roadsides: Porto Rico, St. Thomas, St. Croix.

Leucaena glauca (L.) Benth.

Hillside thickets: Porto Rico, St. Thomas, St. Croix.

Mimosa pudica L.

A common weed: Porto Rico, St. Thomas, St. Croix.

Mimosa Ceratonia L.

Hillside thickets: Porto Rico, St. Thomas, St. Croix.

Acuan virgatum (L.) Medic.

Roadsides, thickets and hillsides: Porto Rico, St. Thomas, St. Croix.

Caesalpiniaceae

Stahlia monosperma (Tul.) Urban. (Sterile.)

Damp low ground: Porto Rico.

Hymenaea Courbaril L.

Fields: Porto Rico, St. Thomas, St. Croix.

Tamarindus indica L.

Thickets: Porto Rico, St. Thomas, St. Croix.

Bauhinia monandra Kurz.

Thickets: Porto Rico, St. Thomas, St. Croix.

Cassia Fistula L.

Fields: Porto Rico, St. Croix.

Cassia bicapsularis L.

Waste places: Porto Rico, Culebra, St. Thomas, St. Croix.

Cassia occidentalis L.

Thickets: Porto Rico, St. Thomas, St. Croix.

Cassia Tora L.

Dry hilltops: Porto Rico, St. Thomas, St. Croix.

Cassia alata L.

Wet thickets: Porto Rico, Culebra, St. Croix.

Chamaecrista Swartzii (Wickstr.) Britton.

On rocks, cliffs or low ground: Porto Rico, Culebra, St. Thomas, St. Croix.

Chamaecrista Chamaecrista (L.) Britton.

In sand: Porto Rico, St. Croix.

Chamaecrista Aeschynomene (DC.) Greene.

Hillsides: Porto Rico.

Chamaecrista grammica (Spreng.) Pollard.

Limestone thickets: Porto Rico.

Parkinsonia aculeata L.

Roadsides and thickets: Porto Rico, St. Thomas, St. Croix.

Guilandina Crista (L.) Small.

Coastal thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Guilandina divergens (Urban) Britton.
Limestone thickets: Culebra, St. Thomas, St. Croix.

FABACEAE

Crotalaria retusa L.
Fields: Porto Rico, St. Thomas, St. Croix.
Crotalaria incana L.
Dry hills: Porto Rico, St. Thomas, St. Croix.
Crotalaria lotifolia L.
Ravines and along trails: Porto Rico, St. Thomas, St. Croix.
Indigofera suffruticosa Mill.
Fields and coastal sands: Porto Rico, St. Thomas, St. Croix.
Indigofera tinctoria L.
Dry thickets: St. Thomas.
Cracca cinerea (L.) Morong.
Dry hillsides or sandy shores: Porto Rico, St. Thomas, St. Croix.
Sabinea florida (Vahl) DC.
Rocky hilltops: Porto Rico, St. Thomas.
Benthamantha caribaea (Jacq.) Kuntze.
Rocky hills and rocky thickets: Porto Rico, Culebra, St. Thomas, St. Croix.
Agati grandiflora (L.) Desv.
Roadsides: Porto Rico, St. Thomas, St. Croix.
Pictetia aculeata (Vahl) Urban.
Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.
Aeschynomene americana L.
Along streams: Porto Rico, St. Thomas, St. Croix.
Meibomia Scorpiurus (Sw.) Kuntze.
Roadsides: Porto Rico, St. Thomas, St. Croix.
Meibomia supina (Sw.) Britton.
Fields: Porto Rico, St. Thomas, St. Croix.
Meibomia spiralis (Sw.) Kuntze.
Dry hillsides: Porto Rico, St. Thomas, St. Croix.
Alysicarpus nummularifolius (L.) DC.
Along trails: Porto Rico, St. Thomas, St. Croix.
Dalbergia Ecastophyllum (L.) Taub.
Coastal thickets: Porto Rico, St. Thomas, St. Croix.
Drepanocarpus lunatus (L. f.) G. F. W. Mey.
Thickets: Porto Rico, St. Thomas, St. Croix.
Ichthyomethia Piscipula (L.) Hitchc.
Coastal thickets: Porto Rico, Culebra, St. Thomas, St. Croix.
Andira jamaicensis (W. Wr.) Urban.
Moist places: Porto Rico, St. Thomas, St. Croix.
Abrus Abrus (L.) W. F. Wight.
Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.
Clitoria Ternatea L.
Roadsides: Porto Rico, St. Thomas, St. Croix.
Bradburya pubescens (Benth.) Kuntze.
Thickets: Porto Rico.

Bradburya virginiana (L.) Kuntze.

Thickets: Porto Rico, Culebra, Culebrita, St. Thomas, St. Croix.

Teramnus labialis Spreng.

Climbing over bushes: Porto Rico, St. Croix.

?Erythrina horrida Eggers.

Rocky hilltops; sometimes used for fencing: Porto Rico, St. Thomas.

Mucuna pruriens (L.) DC.

Climbing over bushes: Porto Rico, St. Thomas, St. Croix.

Galactia dubia DC.

Thickets: Porto Rico, Culebra, Culebrita, St. Thomas, St. Croix.

Galactia striata (Jacq.) Urban.

Thickets and borders of cane-fields: Porto Rico, Culebra, St. Thomas, St. Croix.

Canavalia rusiosperma Urban.

Damp woods: Porto Rico, St. Thomas.

Canavalia lineata (Thunb.) DC.

Coastal sands: Porto Rico, St. Thomas, St. Croix.

Cajan Cajan (L.) Millsp.

Yards and thickets: Porto Rico, St. Thomas, St. Croix.

Dolicholus reticulatus (Sw.) Millsp.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Dolicholus minimus (L.) Medic.

Hillsides: Porto Rico, St. Thomas, St. Croix.

Phaseolus antillanus Urban.

Thickets: Porto Rico.

Phaseolus lathyroides L.

Fields: Porto Rico, St. Thomas, St. Croix.

Vigna luteola (Jacq.) Benth.

Coastal sands: Porto Rico, Culebra, St. Thomas, St. Croix.

Dolichos Lablab L.

Waste places: Porto Rico, St. Croix.

Erythroxylaceae

Erythroxylon brevipes DC.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Zygophyllaceae

Guaiacum officinale L.

Limestone hills: Porto Rico, Culebra, St. Thomas, St. Croix.

Kallstroemia maxima (L.) T. & G.

Roadside banks: Porto Rico, Culebra, St. Thomas, St. Croix.

Rutaceae

Zanthoxylum monophyllum (Lam.) P. Wilson.

Rocky woods: Porto Rico, St. Thomas, St. Croix.

Zanthoxylum martinicense (Lam.) DC.

Fields: Porto Rico, St. Thomas, St. Croix.

Pilocarpus racemosus Vahl.

Rocky woods and thickets: Porto Rico.

Amyris elemifera L.

Rocky woods: Porto Rico, Culebra, St. Thomas, St. Croix.

Triphasia trifolia (Burm. f.) P. Wilson.
Roadsides: Porto Rico, St. Thomas, St. Croix.
Citrus Lima Lunan.
Ravines: Porto Rico, St. Thomas, St. Croix.

Surianaceae

Suriana maritima L.
Coastal cliffs and beaches: Porto Rico, Culebra, St. Thomas, St. Croix.

Burseraceae

Elaphrium Simaruba (L.) Rose.
Hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Meliaceae

Melia Azedarach L.
Roadsides: Porto Rico, St. Thomas, St. Croix.
Trichilia hirta L.
Thickets: Porto Rico, St. Thomas, St. Croix.

Malpighiaceae

Tetrapteris inaequalis Cav.
Damp hillsides: Porto Rico.
Banisteria purpurea L.
Hillsides and rocky hilltops: Porto Rico, Culebra, St. Thomas, St. Croix.
Stigmaphyllon lingulatum (Poir.) Small.
Thickets and fields: Porto Rico, Culebra, St. Thomas, St. Croix.
Byrsonima cuneata (Turcz.) P. Wilson. (*Malpighia lucida* Sw. Prodr. 74. 1788. Not *M. lucida* Mill. 1768.—*Byrsonima lucida* DC. Prodr. 1: 580. 1824.—*Malpighia cuneata* Turcz. Bull. Soc. Nat. Mosc. 31[1]: 390. 1858.—*Byrsonima portoricensis* Stahl Est. 2: 1884.)
Limestone thickets: Porto Rico, St. Thomas.
Malpighia infestissima (A. Juss.) Rich.
Coastal thickets: Culebra, St. Thomas.
Malpighia Shaferi Britton & Wilson.
Ravines: Endemic.
Malpighia linearis Jacq. (*M. angustifolia* L.) has been recorded by Eggers from Vieques. I have not verified this record.

Polygalaceae

Securidaca virgata Sw.
Moist thickets: Porto Rico.

Euphorbiaceae

Savia sessiliflora (Sw.) Willd.
Rocky woods and thickets: Porto Rico, St. Thomas, St. Croix.
Phyllanthus Niruri L.
Roadsides: Porto Rico, St. Thomas, St. Croix.
Xylophylla Epiphyllanthus (L.) Britton.
Cliffs: Porto Rico.
Croton astroites Dryand.
Thickets, rocky places and roadsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Croton betulinus Vahl.

Coastal cliffs and sandy shores: Porto Rico, Culebra, St. Thomas, St. Croix.

Croton flavens L.

Rocky hilltops and pasture lands: Porto Rico, Culebra, Culebrita, St. Thomas, St. Croix.

Croton discolor Willd.

Dry rocky thickets: Porto Rico, St. Thomas, St. Croix.

Croton lobatus L.

Waste places: Porto Rico, St. Thomas, St. Croix.

Argythamnia candicans Sw.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Ricinella Ricinella (L.) Britton. (*Adelia Ricinella* L.; *Ricinella pedunculosa* Muell. Arg.)

Dry hillsides and among rocks: Porto Rico, Culebra, St. Thomas, St. Croix.

Acalypha portoricensis Muell. Arg.

Thickets and rocky slopes: Porto Rico, St. Croix.

Tragia volubilis L.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Ricinus communis L.

Thickets: Porto Rico, St. Thomas, St. Croix.

Jatropha gossypifolia L.

Roadsides and fields: Porto Rico, St. Thomas, St. Croix.

Jatropha multifida L.

Roadsides: Porto Rico, St. Thomas, St. Croix.

Hippomane Mancinella L.

Stony beaches: Porto Rico, Culebra, St. Thomas, St. Croix.

Gymnanthes lucida Sw.

Woods: Porto Rico, Culebra, St. Thomas, St. Croix.

Chamaesyce buxifolia (Lam.) Small.

Coastal sands: Porto Rico, St. Thomas, St. Croix.

Chamaesyce hirta (L.) Millsp.

Roadsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Chamaesyce brasiliensis (Lam.) Small.

Sandy places: Porto Rico.

Chamaesyce prostrata (Ait.) Small.

Sandy places: Porto Rico, Culebrita, St. Thomas, St. Croix.

Chamaesyce articulata (Aubl.) Britton.

Coastal sands: Porto Rico, Culebra, St. Thomas, St. Croix.

Chamaesyce Vahlii (Willd.) P. Wilson. (*Euphorbia Vahlii* Willd.)

Cliffs: Porto Rico.

Aklema petiolaris (Sims) Millsp.

Rocky hilltops: Porto Rico, Culebra, St. Thomas, St. Croix.

Poinsettia heterophylla (L.) Kl. & Garcke.

Waste places: Porto Rico, St. Thomas, St. Croix.

Pedilanthus tithymaloides (L.) Poit.

Coastal cliffs: Porto Rico, St. Croix.

Pedilanthus angustifolius Poit.

Thickets: Porto Rico, Culebra, St. Thomas.

ANACARDIACEAE

Anacardium occidentale L.

Hillside thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Comocladia Dodonaea (L.) Urban.

Limestone thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

CELASTRACEAE

Maytenus elliptica (Lam.) Krug & Urban.

Thickets and rocky woods: Porto Rico, Culebra, St. Thomas, St. Croix.

?Maytenus cymosa Krug & Urban. Specimen immature. Determined from description.

Low ground: St. Thomas, St. Croix.

Gyminda latifolia (Sw.) Urban.

Woods and limestone thickets: Porto Rico, St. Thomas.

Schaefferia frutescens Jacq.

Rocky hillsides and roadsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Elaeodendron xylocarpum (Vent.) DC.

Coastal thickets: Porto Rico, Culebrita, St. Thomas, St. Croix.

HIPPOCRATEACEAE

Hippocratea volubilis L.

Coastal thickets: Porto Rico, St. Thomas.

SAPINDACEAE

Serjania polyphylla (L.) Radlk.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Paullinia pinnata L.

Coastal thickets: Porto Rico, St. Thomas.

Cardiospermum microcarpum H. B. K.

Roadsides: Porto Rico, Culebrita, St. Thomas, St. Croix.

Cardiospermum corindum L.

Borders of trails: Porto Rico, St. Croix.

Sapindus Saponaria L.

Hillside pastures: Porto Rico, St. Thomas, St. Croix.

Cupania triquetra A. Rich.

Ravine: Porto Rico, St. Thomas.

Exothea paniculata (Juss.) Radlk.

Thickets: Porto Rico.

RHAMNACEAE

Krugiodendron ferreum (Vahl) Urban. (Sterile.)

Stony beaches: Porto Rico, Culebra, St. Thomas, St. Croix.

Sarcomphalus domingensis (Spreng.) Krug & Urban.

Thickets: Porto Rico.

Colubrina Colubrina (Jacq.) Millsp.

Limestone thickets and sea-beaches: Porto Rico, Culebra, St. Thomas, St. Croix.

Colubrina reclinata (L'Hér.) Brongn.

Rocky hilltops: Porto Rico, Culebra, St. Thomas, St. Croix.

Zizyphus Jujuba Lam.

Coastal thickets: Culebra.

Gouania lupuloides (L.) Urban.
Thickets: Porto Rico, St. Thomas, St. Croix.

VITACEAE

Cissus sicyoides L.
Thickets: Porto Rico, St. Thomas, St. Croix.
Cissus trifoliata L.
Coastal cliffs: Porto Rico, St. Thomas, St. Croix.

TILIACEAE

Corchorus siliquosus L.
Dry fields: Porto Rico, St. Thomas, St. Croix.
Corchorus hirsutus L.
Coastal sands and limestone thickets: Porto Rico, St. Thomas, St. Croix.
Triumfetta semitriloba Jacq.
Hillsides and pastures: Porto Rico, Culebra, St. Thomas, St. Croix.
Triumfetta rhomboidea Jacq.
Roadsides: Porto Rico, St. Croix.

MALVACEAE

Abutilon hirtum (Lam.) Sweet.
Roadsides: Porto Rico, St. Thomas, St. Croix.
Wissadula amplissima (L.) R. E. Fries.
Dry rocky thickets: Porto Rico, Culebra.
Malvastrum coromandelianum (L.) Garcke.
Moist places: Porto Rico, Culebra, St. Thomas, St. Croix.
Malvastrum corchorifolium (Desr.) Britton.
Thickets: Porto Rico.
Malvastrum spicatum (L.) A. Gray.
Dry hills and moist banks: Porto Rico, Culebra, St. Thomas, St. Croix.
Sida glomerata Cav.
Dry hillsides: Porto Rico, St. Thomas.
Sida carpinifolia L.f.
Dry ground and coastal sands: Porto Rico, St. Thomas.
Sida rhombifolia L.
Coastal sands and moist places: Porto Rico, St. Thomas, St. Croix.
Sida humilis Cav.
In shade on hilltops: Porto Rico, St. Thomas, St. Croix.
Sida glabra Mill.
Dry hills: Porto Rico, Culebra, St. Thomas, St. Croix.
Sida urens L.
Pastures: Porto Rico.
Sida acuminata DC.
Dry rocky thickets and rocky hilltops: Porto Rico, Culebra, St. Thomas, St. Croix.
Malachra alceifolia Jacq.
Hillsides: Porto Rico, Culebra, St. Thomas.
Urena lobata L.
Pasture lands: Porto Rico, Culebra, St. Thomas, St. Croix.

Pavonia spinifex (L.) Cav.

Moist ground: Porto Rico, Culebra, St. Thomas, St. Croix.

Malache scabra B. Vogel.

Sandy thickets: Porto Rico, St. Croix.

Paritium tiliaceum (L.) Juss.

Wet thickets: Porto Rico, St. Thomas, St. Croix.

Hibiscus cannabinus L.

Roadsides: Porto Rico.

Thespesia populnea (L.) Soland.

Coastal thickets: Porto Rico, St. Thomas, St. Croix.

Gossypium brasiliense Macf.

Roadsides: Porto Rico.

Bombacaceae

Ceiba pentandra (L.) Gaertn.

Pastures: Porto Rico, St. Thomas, St. Croix.

Quararibaea turbinata (Sw.) Poir.

Edge of dense woods: Porto Rico, St. Croix.

Sterculiaceae

Melochia pyramidata L.

Roadsides: Porto Rico, St. Thomas, St. Croix.

Melochia tomentosa L.

Dry hills: Porto Rico, Culebra, St. Thomas, St. Croix.

Melochia nodiflora Sw.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Waltheria americana L.

Dry hills and low ground: Porto Rico, St. Thomas, St. Croix.

Ayenia pusilla L.

Dry rocky thickets: Porto Rico, St. Thomas, St. Croix.

Guazuma ulmifolia Lam.

Edge of ravines: Porto Rico, St. Thomas, St. Croix.

Helicteres jamaicensis Jacq.

Thickets: Porto Rico, St. Thomas, St. Croix.

Clusiaceae

Calophyllum Calaba Jacq.

Wet ravines and coastal thickets: Porto Rico, St. Thomas, St. Croix.

Clusia rosea Jacq.

Rocky woods: Porto Rico, Culebra, St. Thomas, St. Croix.

Rheedia portoricensis Urban.

Thickets: Porto Rico.

Bixaceae

Bixa Orellana L.

Thickets: Porto Rico, St. Thomas, St. Croix.

Canellaceae

Canella Winterana (L.) Gaertn.

Coastal thickets: Porto Rico, St. Thomas, St. Croix.

Flacourtiaceae

Samyda dodecandra Jacq.

Limestone thickets and rocky hilltops: Porto Rico, St. Thomas, St. Croix.

Casearia guianensis (Aubl.) Urban.
Thickets: Porto Rico, St. Thomas, St. Croix.
Casearia decandra Jacq.
Rocky hillsides: Porto Rico, St. Thomas, St. Croix.
Casearia sylvestris Sw.
Thickets: Porto Rico, St. Thomas, St. Croix.

Turneraceae

Turnera diffusa Willd.
Rocky thickets: Porto Rico, St. Thomas, St. Croix.
Turnera ulmifolia L.
Coastal sands: Porto Rico, Culebra, St. Thomas, St. Croix.

Passifloraceae

Passiflora suberosa L.
Limestone thickets and hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.
Passiflora foetida L.
Pastures: Porto Rico, Culebra, St. Thomas, St. Croix.
Passiflora rubra L.
Rocky slopes: Porto Rico, St. Thomas, St. Croix.

Caricaceae

Carica Papaya L.
Thickets: Porto Rico, St. Thomas, St. Croix.

Cactaceae

Hylocereus trigonus (Haw.) Safford.
Coastal rocks and hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.
Cactus intortus Mill.
Cliffs of crumbling rock: Porto Rico, St. Thomas, St. Croix.
Opuntia Dillenii (Ker.) Haw.
Coastal cliffs and thickets: Porto Rico, Culebra, St. Thomas, St. Croix.
Opuntia catacantha Link & Otto.
On lime-rocks: Porto Rico, Culebra, St. Thomas, St. Croix.
Opuntia repens Bello.
Dry rocky hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.
Nopalea cochenillifera (L.) Salm-Dyck.
Yards and waste places: St. Thomas and St. Croix, according to Eggers.
Cephalocereus Royeni (L.) Britton & Rose.
Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.
Pereskia Pereskia (L.) Karst.
Rocky woods: St. Thomas, St. Croix. Spontaneous after cultivation.

Thymelaeaceae

Daphnopsis caribaea Griseb.
Rocky woods: Porto Rico, St. Thomas, St. Croix.

Lythraceae

Ginoria Rohrii (Vahl) Koehne.
Thickets: Porto Rico, St. Thomas, St. Croix.

RHIZOPHORACEAE

Rhizophora Mangle L.

Arroyos: Porto Rico, St. Thomas, St. Croix.

COMBRETACEAE

Terminalia Catappa L.

Coastal thickets: Porto Rico, St. Thomas, St. Croix.

Conocarpus erecta L.

Coastal thickets: Porto Rico, St. Thomas, St. Croix.

Bucida Buceras L.

Fields: Porto Rico, Culebra, St. Thomas, St. Croix.

Laguncularia racemosa (L.) Gaertn. f.

In water: Porto Rico, St. Thomas, St. Croix.

MYRTACEAE

Psidium Guajava L.

Fields: Porto Rico, St. Thomas, St. Croix.

Amomis caryophyllata (Jacq.) Krug & Urban.

Hillsides: Porto Rico, St. Croix.

Eugenia ligustrina (Sw.) Willd.

Low woods: Porto Rico, Culebra, St. Thomas, St. Croix.

Eugenia monticola (Sw.) DC.

Rocky places: Porto Rico, Culebra, St. Thomas, St. Croix.

Eugenia buxifolia (Sw.) Willd.

Thickets: Porto Rico, St. Thomas, St. Croix.

Eugenia axillaris (Sw.) Willd.

Limestone thickets: Porto Rico, St. Croix.

Eugenia pseudopsidium Jacq.

Thickets and dense woods: Porto Rico, St. Thomas, St. Croix.

Eugenia floribunda West.

Woods: Porto Rico, St. Thomas, St. Croix.

Eugenia fragrans (Sw.) Willd. (Sterile.)

Hills: Porto Rico, St. Croix.

Eugenia ludibunda Bertero.

Hillside thickets and roadsides: Porto Rico, Culebra, St. Croix.

MELASTOMACEAE

Miconia laevigata (L.) DC.

Deep ravines: Porto Rico, St. Thomas, St. Croix.

Tetrazygia elaeagnoides (Sw.) DC.

Rocky hillsides: Porto Rico, St. Thomas, St. Croix.

Mouriri domingensis (Tuss.) Spach.

Deep ravines: Porto Rico, St. Croix.

ONAGRACLAE

Jussiaea erecta L.

Damp soil by streams: Porto Rico.

Jussiaea suffruticosa L.

Moist places: Porto Rico, St. Thomas, St. Croix.

THEOPHRASTACEAE

Jacquinia Berterii Spreng.

Rocky woods and thickets: Porto Rico, St. Thomas, St. Croix.

Jacquinia barbasco (Loefl.) Mez.

Cliffs: Porto Rico, Culebra, St. Thomas, St. Croix.

MYRSINACEAE

Icacorea guadalupensis (Duch.) Britton. (*Ardisia guadalupensis* Duch.)

Thickets and rocky woods: Porto Rico, St. Thomas, St. Croix.

PLUMBAGINACEAE

Plumbago scandens L.

Openings in rocky woods: Porto Rico, St. Thomas, St. Croix.

SAPOTACEAE

Bumelia Krugii Pierre.

Dry coastal cliff: Porto Rico.

Chrysophyllum pauciflorum Lam.

Along streams: Porto Rico, St. Thomas, St. Croix.

Manilkara duplicata (Sessé & Moc.) Dubard. (*Achras duplicata* Sessé & Moc.; *Mimusops duplicata* Urban.)

Edge of woods: Porto Rico.

Dipholis salicifolia (L.) A. DC.

Forests: Porto Rico, St. Thomas, St. Croix.

EBENACEAE

Maba caribaea (A. DC.) Hiern (*Macreightia caribaea* A. DC.) has been reported from Vieques by Eggers.

OLEACEAE

Forestiera segregata (Jacq.) Krug & Urban.

Coastal thickets and cliffs: Porto Rico, St. Croix.

Forestiera Eggersiana Krug & Urban.

Coastal thickets: Culebra, St. Thomas.

Mayepea caribaea (Jacq.) Kuntze.

Rocky woods: Porto Rico, St. Thomas, St. Croix.

Jasminum pubescens (Retz.) Willd.

Fields: Porto Rico, St. Thomas, St. Croix.

APOCYNACEAE

Allamanda cathartica L.

Fields: Porto Rico, St. Thomas.

Plumiera alba L.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Catharanthus roseus (L.) G. Don.

Coastal sands: Porto Rico, St. Thomas, St. Croix.

Rauwolfia nitida Jacq.

Coastal thickets: Porto Rico, St. Thomas, St. Croix.

Rauwolfia Lamarckii A. DC.

Dry hills and pastures: Porto Rico, Culebra, St. Thomas, St. Croix.

Urechites lutea (L.) Britton.

Sandy shores: Porto Rico, St. Thomas, St. Croix.

Asclepiadaceae

Asclepias curassavica L.

Moist land: Porto Rico, Culebra, St. Thomas, St. Croix.

Calotropis procera (Ait.) Ait. f.

Pastures: Porto Rico, St. Thomas, St. Croix.

Ibatia maritima (Jacq.) Dcne.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Convolvulaceae

Jacquemontia nodiflora (Desr.) G. Don.

Thickets and rocky places: Porto Rico, Culebra, St. Thomas, St. Croix.

Jacquemontia jamaicensis (Jacq.) Hall. f.

Limestone cliffs: Porto Rico, Culebra, St. Thomas, St. Croix.

Jacquemontia pentantha (Jacq.) G. Don.

Coastal thickets and fields: Porto Rico, Culebra, St. Thomas, St. Croix.

Operculina dissecta (Jacq.) House.

Roadsides: Porto Rico, St. Thomas, St. Croix.

Exogonium arenarium Choisy.

Climbing over bushes: Porto Rico, Culebra, St. Thomas, St. Croix.

Exogonium filiforme (Jacq.) Choisy.

Coastal thickets: Porto Rico, St. Thomas, St. Croix.

Ipomoea Nil (L.) Roth.

Roadsides: Porto Rico, St. Thomas, St. Croix.

Ipomoea acuminata (Vahl) R. & S.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Ipomoea Pes-caprae (L.) Roth.

Coastal sands: Porto Rico, St. Thomas, St. Croix.

Ipomoea stolonifera (Cyrill.) Poir.

Coastal sands: Porto Rico, Culebra, St. Croix.

Ipomoea triloba L.

Roadsides and borders of cane-fields: Porto Rico, St. Thomas, St. Croix.

Ipomoea tiliacea (Willd.) Choisy.

Moist thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Ipomoea polyanthes R. & S.

Roadsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Ipomoea tuba (Schl.) G. Don.

On beaches: Porto Rico, St. Thomas, St. Croix.

Rivea campanulata (L.) House.

Coastal thickets: Porto Rico, St. Thomas, St. Croix.

Quamoclit coccinea (L.) Moench.

Hills: Porto Rico, St. Thomas, St. Croix.

Borraginaceae

Cerdana alliodora R. & P. (*Cordia alliodora* Cham.)

Dry hillsides: Porto Rico, St. Thomas.

Sebesten brachycalyx (Urban) Britton.

Coastal cliffs and forests: Porto Rico, Culebra, St. Thomas.

Cordia nitida Vahl.

Thickets: Porto Rico, St. Thomas, St. Croix.

Cordia sulcata DC.

Hillside thickets: Porto Rico, St. Thomas, St. Croix.

Varronia corymbosa Desv. (*Lantana corymbosa* L.; *Cordia ulmifolia* Juss.; *Cordia corymbosa* G. Don.)

Thickets: Porto Rico, St. Thomas, St. Croix.

Bourreria succulenta Jacq.

Thickets and hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Bourreria domingensis (DC.) Griseb.

Limestone thickets: Porto Rico.

Mallotonia gnaphalodes (L.) Britton.

Sea beaches: Porto Rico, Culebra, St. Thomas, St. Croix.

Tournefortia hirsutissima L.

Roadsides: Porto Rico, St. Thomas, St. Croix.

Tournefortia volubilis L.

Limestone thickets: Porto Rico, St. Thomas, St. Croix.

Tournefortia microphylla Bertero.

Rocky hilltops and thickets: Porto Rico, Culebrita, St. Thomas, St. Croix.

Heliotropium curassavicum L.

Low ground: Porto Rico, Culebra, St. Thomas, St. Croix.

Heliotropium parviflorum L.

Dry hillsides and pastures: Porto Rico, Culebra, St. Thomas, St. Croix.

Heliotropium indicum L.

Fields: Porto Rico, Culebra, St. Thomas, St. Croix.

Heliotropium ternatum Vahl.

Dry rocky thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Verbenaceae

Lantana Camara L.

Roadsides, hillsides, or rocky places: Porto Rico, St. Thomas, St. Croix.

Lantana involucrata L.

Coastal sands and thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Lippia geminata H. B. K.

Thickets: Porto Rico.

Valerianodes jamaicensis (L.) Medic.

Roadsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Priva lappulacea (L.) Pers.

Yards and roadsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Citharexylum fruticosum L.

Dry hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Duranta repens L.

Dry hills and coastal cliffs: Porto Rico, St. Thomas, St. Croix.

Volkameria aculeata L.

Coastal thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Avicennia nitida Jacq.

Mangrove swamps: Porto Rico, Culebra, St. Thomas, St. Croix.

LAMIACEAE

Leonotis nepetifolia (L.) R. Br.

Fields: Porto Rico, St. Thomas, St. Croix.

Leonurus sibiricus L.

Roadsides: Porto Rico, St. Thomas, St. Croix.

Salvia occidentalis Sw.

Fields: Porto Rico, St. Thomas, St. Croix.

Hyptis capitata Jacq.

Roadside ditches and along streams: Porto Rico, Culebra, St. Thomas, St. Croix.

Hyptis pectinata (L.) Poit.

Hillsides: Porto Rico, St. Thomas, St. Croix.

Coleus amboinicus Lour.

Among rocks: Porto Rico, St. Thomas, St. Croix.

Ocimum micranthum Willd.

Dry hills: Porto Rico, Culebra, St. Thomas, St. Croix.

SOLANACEAE

Physalis angulata L.

Among rocks: Porto Rico, Culebra, St. Thomas, St. Croix.

Physalis pubescens L.

Porto Rico, St. Thomas, St. Croix; Vieques according to Urban.

Physalis turbinata Medic.

Pastures: Porto Rico, St. Thomas, St. Croix.

Capsicum baccatum L.

Moist thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

Solanum nigrum L.

Waste places: Porto Rico, Culebra, St. Thomas, St. Croix.

Solanum Seaforthianum Andr.

Roadside thickets: Porto Rico, St. Thomas, St. Croix.

Solanum verbascifolium L.

Limestone thickets: Porto Rico, St. Thomas, St. Croix.

Solanum persicifolium Dunal.

Coastal thickets and sandy shores: Porto Rico, Culebra, St. Thomas, St. Croix.

Solanum torvum Sw.

Waste places: Porto Rico, Culebra, St. Thomas, St. Croix.

Solanum polygamum Vahl.

Dry woods: St. Thomas, St. Croix.

Lycopersicum Lycopersicum (L.) Karst.

Waste places: Porto Rico, St. Thomas, St. Croix.

Datura Stramonium L.

Roadsides: Porto Rico, St. Thomas, St. Croix.

Datura Metel L.

Along bays: Porto Rico, St. Thomas, St. Croix.

Datura fastuosa L.

Thickets: Porto Rico, St. Thomas.

Cestrum laurifolium L'Hér.

Thickets and rocky woods: Porto Rico, St. Thomas, St. Croix.

Brunfelsia americana L.

Near streams, dry rocky woods and coastal cliffs: Porto Rico, St. Thomas, St. Croix.

SCROPHULARIACEAE

Capraria biflora L.

Roadsides and fields: Porto Rico, Culebra, St. Thomas, St. Croix.

Scoparia dulcis L.

Roadsides: Porto Rico, St. Thomas, St. Croix.

BIGNONIACEAE

Macrodiscus lactiflorus (Vahl) Bureau.

Limestone thickets: Porto Rico, St. Thomas, St. Croix.

Enallagma latifolia (Mill.) Small.

Along streams: Porto Rico, St. Thomas, St. Croix.

Tecoma stans (L.) H. B. K.

Roadsides: Porto Rico, St. Thomas, St. Croix.

Tabebuia heterophylla (DC.) Britton.

Thickets: Porto Rico, Culebrita, Culebra, St. Thomas, St. Croix.

Bignonia Unguis L.

Climbing over trees: Porto Rico, Culebra, St. Thomas, St. Croix.

PEDALIACEAE

Sesamum orientale L.

Hillsides: Porto Rico.

ACANTHACEAE

Blechum Brownei Juss.

Hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Ruellia tuberosa L.

Rocky hillside: Porto Rico, St. Thomas, St. Croix.

Ruellia coccinea (L.) Vahl.

Shaded thickets: Porto Rico, St. Thomas, St. Croix.

Gerardia tuberosa L.

Dry hillsides: Porto Rico, St. Thomas.

Justicia periplocifolia Jacq.

Thickets and moist places: Porto Rico, Culebra, St. Thomas, St. Croix.

Justicia sessilis Jacq.

Rocky ravines and in shade on hilltops: Porto Rico, Culebra, St. Thomas, St. Croix.

Anthacanthus spinosus (Jacq.) Nees.

Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

PLANTAGINACEAE

Plantago major L.

Yards: Porto Rico, St. Thomas, St. Croix.

RUBIACEAE

Exostema caribaeum (Jacq.) R. & S.

Woods: Porto Rico, Culebra, St. Thomas, St. Croix.

Randia aculeata L.

Thickets: Porto Rico, St. Thomas, St. Croix.

Genipa americana L.
Fields: Porto Rico, St. Thomas.
Guettarda scabra (L.) Lam.
Limestone thickets and pastures: Porto Rico, St. Thomas, St. Croix.
Guettarda parviflora Vahl.
Thickets: Porto Rico, St. Thomas, St. Croix.
Stenostomum acutatum DC.
Coastal cliffs: Porto Rico.
Erithalis fruticosa L.
Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.
Chiococca alba (L.) Hitchc.
Ravines: Porto Rico, St. Thomas, St. Croix.
Scolosanthus versicolor Vahl.
Dry rocky hills: Porto Rico, St. Thomas, St. Croix.
Strumpfia maritima Jacq.
Coastal cliffs: Porto Rico.
Psychotria pinularis Sessé & Moc.
Thickets and banks of streams: Porto Rico, St. Thomas, St. Croix.
Psychotria undata Jacq.
Thickets and ravines: Porto Rico, St. Thomas, St. Croix.
Psychotria Brownei Spreng.
Dense rocky woods: Porto Rico, St. Thomas, St. Croix.
Geophila herbacea (Jacq.) K. Schum.
Creeping among rocks under trees: Porto Rico, St. Thomas.
Faramea occidentalis (L.) A. Rich.
Low woods: Porto Rico, St. Thomas, St. Croix.
Morinda citrifolia L.
Sea-beaches: Porto Rico, St. Thomas, St. Croix.
Ernodea littoralis Sw.
Coastal sands: Porto Rico, Culebra, St. Thomas, St. Croix.
Diodia maritima Thonn.
Coastal sands: Porto Rico, St. Thomas.
Borreria laevis (Lam.) Griseb.
Edge of woods: Porto Rico, St. Thomas, St. Croix.
Borreria verticillata (L.) G. F. W. Mey.
Roadsides: Porto Rico, St. Thomas, St. Croix.
Spermacoce tenuior L.
Pastures and at bases of cliffs: Porto Rico, Culebra, St. Thomas, St. Croix.

Cucurbitaceae

Corallocarpus emetocatharticus (Gros.) Cogn.
Coastal thickets: Porto Rico, Culebra, St. Thomas, St. Croix.
Momordica Charantia L.
Roadside thickets: Porto Rico, Culebra, St. Thomas, St. Croix.
Cucumis Anguria L.
Edge of thickets: Porto Rico, Culebra, St. Thomas, St. Croix.
Lagenaria Lagenaria (L.) Cockerell.
Rocky clearings: Porto Rico, St. Thomas, St. Croix.

Cayaponia americana (Lam.) Cogn.
Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.

GOODENIACEAE

Scaevola Plumierii (L.) Vahl.
Sandy shores: Porto Rico, St. Thomas, St. Croix.

AMBROSIACEAE

Xanthium longirostre Wallr.
Sandy places: Porto Rico, St. Thomas, St. Croix.

CARDUACEAE

Vernonia sericea L. C. Rich.
Thickets: Porto Rico, St. Thomas, St. Croix.
Vernonia albicaulis Pers.
Edge of thickets: Porto Rico, St. Thomas, St. Croix.
Elephantopus mollis H. B. K.
Dry hillsides: Porto Rico, St. Thomas, St. Croix.
Pseudelephantopus spicatus (Juss.) Rohrb.
Roadsides: Porto Rico, St. Thomas, St. Croix.
Ageratum conyzoides L.
Roadsides: Porto Rico, St. Thomas, St. Croix.
Eupatorium odoratum L.
Thickets: Porto Rico, Culebra, St. Thomas, St. Croix.
Eupatorium sinuatum Lam.
Coastal cliffs: Porto Rico, Culebrita, St. Thomas, St. Croix.
Eupatorium portoricense Urban.
Near the coast: Porto Rico.
Mikania cordifolia (L. f.) Willd.
Ravines: Porto Rico, St. Thomas, St. Croix.
Erigeron bellioides DC.
On clay banks: Porto Rico.
Leptilon canadense (L.) Britton.
Roadside ditches: Porto Rico, St. Thomas, St. Croix.
Leptilon bonariense (L.) Small.
Roadside ditches: Porto Rico.
Baccharis dioica Vahl.
Coastal cliffs: St. Croix.
Pluchea odorata (L.) Cass.
Fields and wet sandy soil near the coast: Porto Rico, Culebra, St. Thomas, St. Croix.
Pterocaulon virgatum (L.) DC.
Moist land: Porto Rico, St. Thomas, St. Croix.
Parthenium Hysterophorus L.
Yards: Porto Rico, St. Thomas, St. Croix.
Verbesina alba L.
Damp soil near streams: Porto Rico, St. Thomas, St. Croix.
Borrichia arborescens (L.) DC.
Coastal cliffs and coastal sands: Porto Rico, St. Thomas, St. Croix.

Wedelia parviflora L. C. Rich.

Roadsides: Porto Rico, Culebra, St. Thomas.

Melanthera nivea (L.) Small.

Sandy shores: Porto Rico, Culebra.

Tepion alatum (L.) Britton. (*Verbesina alata* L.).

Yards: Porto Rico, St. Thomas, St. Croix.

Synedrella nodiflora (L.) Gaertn.

Wet fields: Porto Rico, Culebra, St. Thomas, St. Croix.

Bidens cynapiifolia H. B. K.

Waste places: Porto Rico, Culebra, St. Thomas, St. Croix.

Cosmos caudatus H. B. K.

Moist ground: Porto Rico, St. Thomas, St. Croix.

Pectis humifusa Sw.

Coastal cliffs: Porto Rico, St. Thomas, St. Croix.

Pectis linifolia L.

Dry hillsides: Porto Rico, Culebra, St. Thomas, St. Croix.

Emilia sonchifolia (L.) DC.

Roadsides: Porto Rico, Culebra, St. Thomas, St. Croix.

CICHORIACEAE

Sonchus oleraceus L.

Waste places: Porto Rico, Culebra, St. Thomas, St. Croix.

Lactuca intybacea Jacq.

Roadsides: Porto Rico, St. Thomas, St. Croix.

PTERIDOPHYTA

(*Determined by Miss Margaret Slosson*)

POLYPODIACEAE

Dryopteris tetragona (Sw.) Urban.

Shady places: Porto Rico, St. Thomas, St. Croix.

Asplenium pumilum Sw.

Shaded banks: Porto Rico, St. Thomas.

Pityrogramma calomelanos (L.) Link.

Base of shaded rocks: Porto Rico, St. Thomas, St. Croix.

Doryopteris pedata (L.) Fée.

Shaded rocks and ravines: Porto Rico, St. Thomas.

Adiantum villosum L.

Ravines: Porto Rico, St. Thomas, St. Croix.

Adiantum fragile Sw.

Shaded banks in woods: Porto Rico, St. Thomas, St. Croix.

Paltonium lanceolatum (L.) Presl.

Epiphytic on palms, and on rocks: Porto Rico, St. Thomas.

Polypodium aureum L.

On rocks: Porto Rico, St. Thomas.

Campyloneurum phyllitidis (L.) Presl.

Shaded rocks in woods: Porto Rico, St. Thomas, St. Croix.

Phymatodes exiguum (Hew.) Underw.

On rocks and stems of bushes: Porto Rico, St. Croix.

Acrostichum aureum L.

Borders of mangrove swamps: Porto Rico, St. Thomas.

Acrostichum excelsum Maxon.

Ravines near water: Porto Rico, St. Thomas, St. Croix.

MUSCI

(*Determined by Mrs. E. G. Britton*)

Calymperaceae

Calymperes Richardi C. M.

On rocks: Porto Rico, St. Thomas.

Leucodontaceae

Pseudocryphaea flagellifera (Brid.) E. G. Britt.

On trees: Porto Rico.

Neckeraceae

Neckera jamaicensis (Gmel.) E. G. Britt.

On rocks: Porto Rico.

Plagiotheciaceae

Taxithelium planum (Brid.) Mitt.

On rocks: Porto Rico, St. Thomas.

Sematophyllaceae

Sematophyllum admistum (Sull.) Mitt.

On rotten log: Porto Rico, St. Thomas.

HEPATICAE

(*Determined by Professor A. W. Evans*)

Jungermanniaceae

Brachiolejeunea insularis Evans.

On rocks: Porto Rico.

Euosmolejeunea clausa (Nees & Mont.) Evans.

On rocks: Porto Rico, St. Thomas.

BASIDIOMYCETES

(*Determined by Dr. W. A. Murrill*)

Auriculariaceae

Auricularia nigrescens (Sw.) Farl.

On dead wood.

Polyporaceae

Coriolus pinsitus (Fries) Pat.

On dead wood: Porto Rico, Culebra.

Coriolus maximus (Mont.) Murrill.

On stumps in woods: Porto Rico, St. Thomas.

Pycnoporus sanguineus (L.) Murrill.

On dead wood: Porto Rico, Culebra.

Hapalopilus gilvus (Schw.) Murrill.

On decaying logs: Porto Rico, St. Thomas.

Inonotus corrosus Murrill.
On dead wood: Porto Rico.
Fulvifomes dependens Murrill.
On dead wood: Porto Rico.
Gloeophyllum striatum (Sw.) Murrill.
On dead wood: Porto Rico, Culebra.

AGARICACEAE

Schizophyllus alneus (L.) Schroet.
On dead trees and branches: Porto Rico, Culebra.
Marasmius sp. (indeterminable).
Lentinus strigosus (Schw.) Fries.
On logs: Porto Rico.

THELEPHORACEAE

Stereum sp. (undetermined).
On dead wood.

UREDINALES

(*Determined by Professor J. C. Arthur*)

COLEOSPORIACEAE

Coleosporium Ipomoeae (Schw.) Burr.
On *Ipomoea stolonifera* (Cyrill.) Poir.; also *Quamoclit coccinea* (L.) Moench: Porto Rico, St. Croix.

PUCCINIACEAE

Puccinia lateritia Berk. & Curt.
On *Spermacoce tenuior* L.: Porto Rico.
Puccinia heterospora Berk. & Curt.
On *Sida humilis* Cav.: Porto Rico, St. Croix.

SUMMARY

Cryptogams	Fungi	15
	Hepatics	2
	Mosses	5
	Ferns	12
Phanerogams	Monocotyledons	97
	Dicotyledons	448
		579

GENERAL INDEX

PAGE

Accessions 31, 204, 276
Accountant. Schedule of Expenditures, during 1911 50
during 1912 218
during 1913 298
Additions to the Paleobotany of the Cretaceous Formation on Long Island .. 154
Administration 16, 184, 262
Aid for Students Research. Research Scholarships and 14
Annual Members, for 1911 71
for 1912 235
for 1913 313
Appended. Reports 17, 185, 263
Approach to the Bronx Park Elevated Railroad Station 258
Aquatic Garden 27, 195, 272
Arboretum. Deciduous 24, 192, 269
Assistance and Investigations 33, 201, 279
Assistant Director. Report, for 1911 18
for 1912 185
for 1913 264
Auditor, Special. Report, for 1911 86
for 1912 250
for 1913 329

Barnhart, J. H. Report of the Bibliographer, for 1913 290
Report of the Librarian, for 1911 45
for 1912 212
Benefactors, for 1911 68
for 1912 232
for 1913 309
Bibliographer. Report, for 1913 290
Bolivia. Collected by R. S. Williams. New Species from 89
Book Fund. Special. Contributions to 10, 178
Boundary Walls and Fences 258
Bridges 4, 174, 256
Britton, N. L. Report of the Secretary and Director-in-Chief, for 1911 1
for 1912 171
for 1913 253
Bronx Park Elevated Railroad Station. Approach to the 258
Buildings 5, 48, 175, 216, 257, 295
Grounds and 18, 185
Bulletin 19, 186, 264

Chairman of the Scientific Directors. Report, for 1911 65
for 1912 228
for 1913 302
Collected by R. S. Williams. New Species from Bolivia 89
Collection of Darwiniana. The Charles Finney Cox Memorial 183
The Synoptic 32, 199, 278
Collections. Miscellaneous 26, 194, 272
Columbia University Herbarium 279
Conference Meetings 40, 206
Conservatories 24, 192, 270
Conservatory Lily Pools 27, 195, 272
Conserving of Herbarium Specimens. Mounting and 279
Considerations. Financial 17, 185, 263
Contributions 19, 187, 265
to Exploration Fund 13, 181
to Library Fund 178
to Museum and Herbarium Fund 9, 178
to Plant Fund 8, 176
to Special Book Fund 13
to Special Fund 178, 181
Corbett, A. J. Report of the Superintendent of Buildings and Grounds, for 1911 46
for 1912 214
for 1913 294
Cox, C. F. Report of the Treasurer, for 1911 82
Cox Memorial Collection of Darwiniana. The Charles Finney 83
Cretaceous Formation on Long Island. Additions to the Paleobotany of the. 154
Curator, of the Economic Collections. Report of the Honorary, for 1911 ... 37
for 1912 204
for 1913 283
of the Museums and Herbarium. Report of the Head, for 1911 31
for 1912 197
for 1913 276

Darwiniana. The Charles Finney Cox Memorial Collection of 183
Deciduous Arboretum 24, 192, 269
Decorative Plantations 28, 195, 273
Desert Plants 27, 194, 272
Director, Assistant. Report, for 1911 18
for 1912 185
for 1913 264
in-Chief. Secretary and. Report, for 1911 1
for 1912 171
for 1913 253
of the Laboratories. Report, for 1911 38
for 1912 206
for 1913 284
Drainage 49, 214, 294

Grading and 2, 172, 256
Duties. Routine 285

Economic Collections. Report of the Honorary Curator, for 1911 37
for 1912 204
for 1913 283
Garden 27, 194, 272
Museum. The 31, 199, 277
Elevated Railroad Station. Approach to the Bronx Park 258
Exhibit. Microscope 32, 199, 278
Plant Photograph 32, 199, 278
Exhibitions. Floral 12, 180, 261
Exhibits. Public 15
Expenditures. Schedule of, for 1911 50
for 1912 218
for 1913 298
Experimental Garden and Greenhouse. The 208, 284
Exploration 12, 180, 261
Fund. Contributions to 13, 181
Extension of Water Supply 48

Features. Natural 8, 177, 259
Fellows for Life, for 1911 69
for 1912 233
for 1913 310
Fellowship Members, for 1911 71
for 1912 235
for 1913 312
Fences. Boundary Walls and 258
Financial Considerations 17, 185, 263
Flora. Local 32, 199, 278
North American 19, 188, 264
Floral Exhibitions 12, 180, 261
Formation on Long Island. Additions to the Paleobotany of the Cretaceous. 154
Fossil Plant Museum. The 31, 198, 277
Fruticetum 24, 192, 269
Fund. Exploration. Contributions to 13, 181
Library. Contributions to 178
Museum. Contributions to 9, 178
and Herbarium. Contributions to 9, 178
Plant. Contributions to 8, 176, 259
Special Book. Contributions to 10
Special. Contributions to 178, 181
Student's Research 14, 182, 262

Garden and Greenhouse. The Experimental 208, 284
Aquatic 27, 195, 272
Economic 27, 194, 272
Herbarium 278

Morphological....26, 194, 272
The New York Botanical: Features, Natural....8, 177, 259
Gardener, Head. Report, for 1911.... 24
for 1912.... 192
for 1913.... 269
General Horticultural Operations....28, 195, 273
Grading and Drainage....2, 172, 256
Regulating and....46, 214, 294
Greenhouse. The Experimental Garden and....208, 284
Groesbeck, Walter S. Accountant. Schedule of Expenditures, for 1911.... 50
for 1912.... 218
for 1913.... 298
Grounds....49, 216, 296
Buildings and....18, 185
Herbaceous....24, 193, 269
Morphological.... 41
Guard Rails....48, 216

Harlow, S. H. Report of the Librarian, for 1913.... 292
Head Curator of the Museums and Herbarium. Report, for 1911.... 31
for 1912.... 197
for 1913.... 276
Gardener. Report, for 1911.... 24
for 1912.... 192
for 1913.... 269
Herbaceous Grounds....24, 192, 269
Herbaria....32, 200, 278
Herbarium....9, 178, 260
Columbia University.... 279
Fund. Museum and.... 9
Garden.... 278
Labeling. Recording and....26, 194, 271
Specimens. Mounting and Conserving of.... 279
Hollick, Arthur. Additions to the Paleobotany of the Cretaceous Formation on Long Island.... 154
Honorary Curator of the Economic Collections. Report, for 1911.... 37
for 1912.... 204
for 1913.... 283
Horticultural Operations. General....28, 195, 273

Instruction. Public....180, 261
Investigations....14, 30, 182, 262
Assistance and....33, 201, 279
Lectures and....197, 276
Personal....22, 39, 191, 206, 268, 285
Investigators. Students and....41, 209, 287
Island. The Vegetation of Vieques.... 379

Journal....18, 186, 264

Labeling. Recording and Herbarium....26, 194, 271
Laboratories....10, 38, 179, 206, 260, 284
Director of the. Report, for 1911.... 38
for 1912.... 206
for 1913.... 284
Lectures....19, 188, 265
Investigations and....197, 276
Public....19, 188, 265
Instruction....180, 261
School....21, 190, 267
Teaching and.... 11
Librarian. Report, for 1911.... 45
for 1912.... 212
for 1913.... 292
Library....10, 178, 260
Life Members, for 1911.... 69
for 1912.... 233
for 1913.... 310
Lily Pools. Conservatory....27, 195, 272
Local Flora. The....32, 199, 278
Long Island. Additions to the Paleobotany of the Cretaceous Formation on. 154
Meetings. Conference....40, 206
Scientific....22, 190, 268
Members. Annual, for 1911.... 71
for 1912.... 235
for 1913.... 313
Fellowship, for 1911.... 71
for 1912.... 235
for 1913.... 312
Life, for 1911.... 69
for 1912.... 233
for 1913.... 310
Sustaining, for 1911.... 71
for 1912.... 235
for 1913.... 312
Memorial Collection of Darwiniana. The Charles Finney Cox.... 183
Merrill, J. L. Report of the Special Auditor, for 1911.... 86
Meteorological Records....40, 206
Mexico. The Polyporaceae of.... 137
Microscope Exhibit. The....32, 199, 278
Miscellaneous Collections....26, 194, 272
Morphological Garden....26, 41, 194, 272
Mosses. Philippine.... 331
Mounting and Conserving of Herbarium Specimens.... 279
Murrill, W. A. Report of the Assistant Director, for 1911.... 18
for 1912.... 185
for 1913.... 264

MURRILL, W. A. The Polyporaceae of Mexico 137
Museum 8, 31, 177, 198, 260, 277
and Herbarium Fund. Contributors to 9, 178
Economic 31, 199, 277
Fossil Plant 31, 198, 277
Systematic 32, 199, 277
Mycologia 18, 186, 264

Nash, G. V. Report of the Head Gardener, for 1911 24
for 1912 192
for 1913 269
Native Plants. Preservation of 15, 182, 262
Natural Features 8, 177, 259
New Species from Bolivia. Collected by R. S. Williams 89
North American Flora 19, 33, 188, 264
Nurseries. Propagating Houses and 25, 193, 271

Operations. General Horticultural 28, 195, 273

Paleobotany of the Cretaceous Formation on Long Island. Additions to the. 154
Park Elevated Railroad Station. Approach to the Bronx 258
Paths 295
Roads and 3, 47, 173, 215, 256
Patrons, for 1911 68
for 1912 232
for 1913 309
Personal Investigations 22, 39, 191, 206, 268, 285
Philippine Mosses 331
Photograph Exhibit. Plant 32, 199, 278
Pinetum 24, 192, 270
Plant Fund. Contributions to 8, 176, 259
Plant Photograph Exhibit 32, 199, 278
Plantations. Decorative 28, 195, 273
Systematic 24, 192, 269
Planting. Plants and 7, 175, 259
Plants and Planting 7, 175, 259
Desert 27, 194, 272
Preservation of Native 15, 182, 262
Police Protection 16
Polyporaceae of Mexico 137
Pools. Conservatory Lily 27, 195, 272
Preservation of Native Plants 15, 182, 262
Propagating Houses and Nurseries 25, 193, 271
Protection. Police 16
Public. Exhibits 15
Instruction 180, 261
Lectures 19, 188, 265
Publications 18, 186, 264
Bulletin 19, 187, 264

Contributions 19, 187, 265
Journal 18, 186, 264
Mycologia 18, 186, 264
North American Flora 19, 188, 264

Rails. Guard 48, 216
Recording and Herbarium. Labeling 26, 194, 271
Records. Meteorological 40, 206
Regulating and Grading 46, 214, 294
Report. Assistant Director, for 1911 18
for 1912 185
for 1913 264
Bibliographer for 1913 290
Chairman of the Scientific Directors, for 1911 65
for 1912 228
for 1913 302
Committee on Patrons, Fellows, and Members for 1911 68
for 1912 232
for 1913 309
Director of the Laboratories, for 1911 38
for 1912 206
for 1913 284
Head Curator of the Museums and Herbarium, for 1911 31
for 1912 197
for 1913 276
Head Gardener, for 1911 24
for 1912 192
for 1913 269
Honorary Curator of the Economic Collections, for 1911 37
for 1912 204
for 1913 283
Librarian, for 1911 45
for 1912 212
for 1913 292
Secretary and Director-in-Chief, for 1911 1
for 1912 171
for 1913 253
Special Auditor, for 1911 86
for 1912 250
for 1913 329
Superintendent of Buildings and Grounds, for 1911 46
for 1912 214
for 1913 294
Treasurer, for 1911 82
for 1912 246
for 1913 324
Reports Appended 17, 185, 263
Research Fund. Students 14, 182, 262

Scholarships and Aid for Students 14
Rhododendron Banks 27, 195, 272
Roads and Paths 3, 47, 173, 215, 256
Rose Bed 272
Routine Duties 285
Rusby, H. H. New Species from Bolivia, Collected by R. S. Williams 89
Rusby, H. H. Report of the Chairman of the Scientific Directors, for 1911 .. 65
for 1912 228
for 1913 302
Report of the Honorary Curator of the Economic Collections, for 1911 37
for 1912 204
for 1913 283

Salicetum 24, 192, 269
Schedule of Expenditures, During the Year 1911 50
During the Year 1912 218
During the Year 1913 298
Scholarships and Aid for Students Research. Research 14
School Lectures 21, 190, 267
Scientific Directors. Report of the Chairman, for 1911 65
for 1912 228
for 1913 302
Meetings 22, 190, 268
Scrymser, J. A. Report of the Treasurer, for 1912 246
for 1913 324
Secretary and Director-in-Chief. Report, for 1911 1
for 1912 171
for 1913 253
Small, J. K. Report of the Head Curator of the Museums and Herbarium,
for 1911 31
for 1912 197
for 1913 276
Special Auditor. Report, for 1911 86
for 1912 250
for 1913 329
Book Fund. Contributions to 10, 178
Species from Bolivia, Collected by R. S. Williams. New 89
Specimens. Mounting and Conserving of Herbarium 279
Stone, A. W. Report of the Special Auditor, for 1912 250
for 1913 329
Stout, A. B. Report of the Director of the Laboratories, for 1911 38
for 1912 206
for 1913 284
Students and Investigators 41, 209, 287
Research Fund 14, 182, 262
Scholarships and Aid for 14
Superintendent of Buildings and Grounds. Report, for 1911 46
for 1912 214
for 1913 293

Sustaining Members, for 1911 71
for 1912 235
for 1913 312
Synoptic Collection. The 32, 199, 278
Systematic Museum. The 32, 199, 277
Plantations 24, 192, 269

Teaching. Lectures and 11
Treasurer. Report, for 1911 82
for 1912 246
for 1913 324

Vegetation of Vieques Island. The 379
Vieques Island. The Vegetation of 379
Viticetum 24, 192, 270

Walls and Fences. Boundary 258
Water Supply 5, 175, 257
Extension of 48
WILLIAMS, R. S. New Species from Bolivia, Collected by 89
Philippine Mosses 331
WILSON, PERCY. The Vegetation of Vieques Island 379

GENERIC INDEX

Abortiporus, 138
Abrus, 392
Abutilon, 43, 210, 211, 287, 289, 397
Acacia, 90, 391
Acalypha, 101, 395
Achras, 401
Achyranthes, 388
Acrocryphaea, 352
Acrodiclidium, 389
Acrostichum, 409
Actinodontium, 362
Acuan, 391
Adelia, 395
Adiantum, 408
Aerobryopsis, 356
Aerobryum, 357
Aeschynomene, 392
Agati, 392
Agave, 386
Ageratum, 407
Aklema, 395
Albizzia, 390
Allamanda, 401
Aloe, 386
Alpinia, 386
Althaea, 209, 210, 287
Alysicarpus, 392
Amanoa, 100
Amaranthus, 388
Amelanchier, 275
Amomis, 400
Amyris, 283, 393
Anacardium, 396
Anastrophus, 383
Andira, 392
Annona, 389
Anomobryum, 348
Anthacanthus, 405
Anthurium, 385
Antigonum, 387
Aquilegia, 288, 304
Aralia, 167, 169
Ardisia, 401
Argemone, 390
Argythamnia, 395
Arthrostylidium, 384
Arundo, 384
Asclepias, 402
Aspidosperma, 113
Asplenium, 408
Atriplex, 388
Auricularia, 409
Avicennia, 403
Ayenia, 398
Azalea, 275

Baccharis, 129, 130, 407
Banisteria, 394
Banisteriopsis, 96, 97
Barbella, 356
Barbula, 342
Batis, 388
Bauhinia, 92, 93, 391
Befaria, 110
Begonia, 108
Benthamantha, 392
Bidens, 131, 408
Bignonia, 405
Biophytum, 95
Bixa, 398
Bjerkandera, 138
Blechum, 405
Boerhavia, 388
Borreria, 406
Borrichia, 407
Bourreria, 403
Bouteloua, 384
Brachiolejeunea, 409
Brachistus, 117
Brachymenium, 348
Brachythecium, 374, 375
Bradburya, 392, 393
Brassica, 390
Braunfelsia, 334
Breutelia, 351
Bromelia, 385
Brunfelsia, 405
Bryophyllum, 390
Bryum, 203, 287, 304, 334, 348–350
Bucida, 400
Buddleia, 112, 113
Bumelia, 401
Byrsonima, 394

Cactus, 399
Cajan, 393
Cakile, 390
Calamagrostis, 207
Calea, 132
Calliandra, 390
Callicostella, 361
Callisia, 386

Calophyllum, 398
Calotropis, 402
Calymperes, 340, 409
Calyptothecium, 357–359, 378
Campylium, 365
Campylodontium, 360
Campyloneurum, 408
Campylopodium, 333
Campylopus, 335, 336
Canavalia, 393
Canella, 398
Caopia, 105
Capparis, 390
Capraria, 405
Capsicum, 404
Cardiospermum, 396
Carex, 39, 41, 187, 206, 207, 284, 285, 286
Carica, 399
Casearia, 399
Cassia, 94, 164, 169, 391
Cassytha, 389
Castalia, 272, 389
Catharanthus, 401
Catharinaea, 351
Cayaponia, 407
Cecropia, 387
Cedrela, 99
Ceiba, 398
Celastrophyllum, 165, 169
Celosia, 388
Cenchrus, 383
Centropogon, 123
Centrostachys, 388
Cephalocereus, 399
Ceratodon, 332
Cerdana, 402
Ceriomyces, 138
Cerrenella, 138
Cestrum, 404
Chaetocarpus, 102
Chaetochloa, 383
Chaetomitrium, 360, 362
Chamaecrista, 391
Chamaecyparis, 270, 275
Chamaesyce, 395
Chenopodium, 388
Chiococca, 406
Chionostomum, 371
Chloris, 384
Chlorophora, 387
Chrysobalanus, 390
Chrysophyllum, 401
Cichorium, 207–209, 285, 286, 288
Cissampelos, 389
Cissus, 397
Citharexylum, 115, 403
Citrus, 394
Claopodium, 363
Clastobryum, 360
Clavija, 111
Cleome, 390
Clitoria, 392
Clusia, 105, 398
Coccolobis, 387, 388
Coccothrinax, 385
Coix, 382
Coleosporium, 410
Coleus, 207, 208, 286–288, 304, 404
Coltricia, 138
Colubrina, 396
Commelina, 385, 386
Comocladia, 396
Conocarpus, 400
Corallocarpus, 406
Corchorus, 397
Cordia, 403
Coriolellus, 138
Coriolopsis, 138–140, 153
Coriolus, 140–143, 153, 409
Cosmos, 408
Cracca, 392
Crataegomespilus, 208
Crataegus, 15, 197
Credneria, 168, 170
Crotalaria, 392
Croton, 100, 394, 395
Ctenidium, 365
Cucumis, 406
Cupania, 396
Cusparia, 98
Cyathophorella, 362
Cyclodictyon, 361
Cycloporellus, 143
Cymbopogon, 382
Cyperus, 384
Cyphomandra, 119
Cytisus, 208

Dactyloctenium, 384
Daedalea, 151, 152, 153
Dalbergia, 392
Daltonia, 361
Daphnopsis, 399
Datura, 404
Dendropemon, 387
Desmotheca, 343
Dicella, 98
Dichromena, 385
Dicranella, 332, 333
Dicranoloma, 335
Dicranum, 203, 335
Dieffenbachia, 385
Digitalis, 289, 304
Diodia, 406
Dipholis, 401
Dipladenia, 114
Diplostephium, 128
Distichophyllum, 361
Ditrichum, 332

Dolicholus, 393
Dolichos, 393
Doryopteris, 408
Drepanocarpus, 392
Dryopteris, 408
Duranta, 403

Earliella, 143
Echinochloa, 383
Ectropothecium, 367, 368
Elaeodendron, 396
Elaphrium, 394
Eleocharis, 384, 385
Elephantopus, 407
Eleusine, 384
Elfvingia, 148
Elmeriobryum, 366, 367
Embothriopsis, 159, 169
Embothrium, 160, 169
Emilia, 408
Enallagma, 405
Encelia, 131
Endotrichella, 352
Entodon, 360
Epidendrum, 386
Eragrostis, 384
Eranthemum, 208
Erigeron, 407
Eriosema, 90
Erithalis, 406
Ernodea, 406
Erythrina, 393
Erythrodontium, 361
Erythroxylon, 393
Esenbeckia, 98
Eucalyptus, 166, 170
Eugenia, 108, 400
Euosmolejeunea, 409
Eupatorium, 407
Euphorbia, 395
Eustachys, 384
Euterpe, 385
Exogonium, 402
Exostema, 405
Exothea, 396

Faramea, 406
Fatsia, 205
Favolus, 143, 144, 151, 153
Ficus, 158, 159, 169, 387
Fimbristylis, 385
Fissidens, 203, 338
Flaviporellus, 144
Flaviporus, 144
Fleurya, 387
Floribundaria, 356
Fomes, 148, 149, 153
Fomitella, 149
Fomitiporia, 138
Forestiera, 401
Frankenia, 106
Franseria, 130, 131
Fulvifomes, 410
Funalia, 144
Funaria, 346
Furcraea, 386
Fuscoporella, 138
Fuscoporia, 138

Galactia, 393
Ganoderma, 149, 150, 153
Garckea, 332
Garovaglia, 352, 353
Genipa, 406
Geophila, 406
Gerardia, 405
Ginoria, 399
Girardinia, 283
Gloeophyllum, 152, 153, 410
Glyptothecium, 352
Gomphrena, 89
Gossypium, 398
Gothofreda, 113
Gouania, 103, 397
Grifolia, 144, 153
Grindelia, 128
Guaiacum, 393
Guazuma, 398
Guettarda, 406
Guilandina, 391, 392
Gyminda, 396
Gymnanthes, 395
Gymnosporangium, 19, 43
Gymnostomum, 340

Hapalopilus, 144, 409
Helicteres, 398
Heliotropium, 403
Hexagona, 145, 153
Hibiscus, 207–209, 211, 275, 284, 286, 304, 398
Hieracium, 135
Himantocladium, 359
Hippocratea, 396
Hippomane, 395
Hiraea, 95
Holcus, 382
Homaliodendron, 359, 360
Homalothecium, 374
Hordeum, 210, 287
Hylocereus, 399
Hymenaea, 391
Hymenocallis, 386
Hymenodon, 350
Hymenostylium, 340
Hyophila, 340, 341
Hypnodendron, 376
Hypoterygium, 362
Hyptis, 404

Ibatia, 402
Icacorea, 401
Ichthyomethia, 392
Ilex, 29
Indigofera, 392
Inga, 90, 390
Inonotus, 146, 410
Ipomoea, 402
Iresine, 388
Irpiciporus, 146
Isopterygium, 369

Jacaratia, 107
Jacquemontia, 402
Jacquinia, 401
Jagerinopsis, 354
Jasminum, 401
Jatropha, 395
Juglans, 157, 169
Juniperus, 270
Jussiaea, 400
Jussieua, 109, 110
Justicia, 405

Kallstroemia, 393
Krugiodendron, 396

Laburnum, 269, 270
Lactuca, 408
Laetiporus, 146
Lagenaria, 406
Laguncularia, 400
Lantana, 403
Lasiacis, 383
Laurophyllum, 162, 163, 169, 170
Laurus, 162, 163, 169
Ledocarpon, 95
Leguminosites, 164
Lentinus, 410
Lenzites, 152, 153
Leonotis, 404
Leonurus, 404
Lepidium, 390
Leptilon, 407
Leptochloa, 384
Leptoporus, 146
Leucaena, 91, 391
Leucobryum, 337, 338
Leucoloma, 335
Leucophanes, 338
Ligustrum, 40, 43, 167, 169, 210, 211, 289
Lilium, 27, 195
Lippia, 116, 403
Liquidambar, 153
Liriodendron, 165
Liriodendropsis, 164, 165, 169
Lupinus, 210, 287, 289
Lycium, 117
Lycopersicum, 404

Maba, 401
Macleania, 111
Macreightia, 401
Macrodiscus, 405
Macrohymenium, 373
Macromitrium, 343–345
Macrothamnium, 367
Magnolia, 159–161, 169
Malache, 398
Malachra, 397
Mallotonia, 403
Malpighia, 394
Malvastrum, 397
Mandevilla, 114
Manilkara, 401
Marasmius, 289, 304, 410
Mayepaea, 401
Maytenus, 396
Meibomia, 392
Meiothecium, 371
Melanthera, 408
Melia, 394
Melochia, 398
Merceya, 342, 343
Merceyopsis, 342
Mesosphaerum, 116
Meteoriopsis, 357
Miconia, 400
Microporellus, 146
Microtea, 389
Mikania, 127, 407
Mimosa, 91, 391
Mimusops, 401
Mirabilis, 40, 208, 210, 388
Misanteca, 389
Miscanthus, 44, 209, 211
Mniodendron, 376
Mnium, 350
Mollugo, 389
Momisia, 387
Momordica, 406
Monopyle, 119
Morinda, 406
Moringa, 390
Morisonia, 390
Mouriri, 400
Mucuna, 393
Myrica, 167
Myriophyllum, 110
Myrtophyllum, 166, 167, 169
Myrtus, 108

Neckera, 358, 409
Neckeropsis, 358
Nectandra, 163, 389
Nelumbo, 160, 169
Neolindbergia, 352
Nicotiana, 287
Nopalea, 399
Nymphaea, 389

Ocimum, 404
Ocotea, 163
Octoblepharum, 338
Oenothera, 110, 285
Olyra, 383
Onagra, 209
Oncidium, 386
Operculina, 402
Oplismenus, 383
Opuntia, 205, 284, 399
Oreodaphne, 163
Oreodoxa, 385
Oreoweisia, 334
Orthomnium, 350
Ouratea, 103
Oxalis, 95
Oxydendrum, 197
Oxyrrhynchium, 375

Paeonia, 283
Palaeanthus, 156, 157
Palicourea, 121
Paltonium, 408
Panicum, 383
Papillaria, 355, 356
Paritium, 398
Parkinsonia, 391
Parthenium, 407
Paspalum, 382
Passiflora, 107, 283, 399
Paullinia, 396
Paulownia, 274
Pavonia, 398
Pectis, 408
Pedilanthus, 395
Pelargonium, 208, 265
Pelekium, 363
Peperomia, 387
Pereskia, 399
Persea, 163
Petiveria, 389
Phaeolus, 146
Pharus, 383
Phaseolus, 288, 304, 393
Philodendron, 385
Philonotis, 350, 351
Philoxerus, 388
Phlox, 210, 287, 289, 304
Phoenix, 385
Pholia, 346, 347
Phoradendron, 305
Phyllanthus, 100, 394
Phymatodes, 408
Physalis, 404
Phytophora, 211, 290
Picea, 270
Pictetia, 392
Pilea, 387
Pilocarpus, 393
Pilopogon, 336
Pinus, 275
Piper, 386
Piptocarpha, 123
Pisonia, 388
Pitcairnia, 385
Pithecolobium, 390
Pityrogramma, 408
Plantago, 405
Pleuropus, 373, 374, 377
Pluchea, 407
Plumbago, 401
Plumiera, 401
Podozamites, 155, 156, 169
Pogonatum, 351, 352
Pogonomyces, 146
Poinsettia, 395
Polycodium, 187
Polypodium, 408
Polyporus, 144, 146, 147, 150, 153
Polystictus, 147, 153
Polytrichum, 203
Populus, 168
Porotrichum, 360
Portulaca, 389
Pouzolzia, 283, 387
Priva, 403
Pseudelephantopus, 407
Pseudocryphaea, 409
Pseudoleskeopsis, 362
Pseudopohlia, 346, 376
Psidium, 400
Psychotria, 283, 405, 406
Pterobryopsis, 355
Pterocaulon, 407
Puccinia, 410
Pycnoporus, 409
Pylaisia, 361
Pyronema, 187
Pyropolyporus, 150, 151, 153

Qualea, 99
Quamoclit, 402
Quararibaea, 398

Racelopus, 351
Racopilum, 362
Rajania, 386
Randia, 120, 405
Rapanea, 112
Rauwolfia, 401
Rhabdoweisia, 334
Rhabdoweisiella, 333, 334, 376
Rhacopilum, 362
Rhaphidostegium, 371, 372
Rheedia, 398
Rhizogonium, 350
Rhizophora, 400
Rhodobryum, 350
Rhododendron, 27, 195, 197
Rhynchostegium, 375

Ricinella, 395
Ricinus, 395
Rigidoporus, 147
Rinorea, 106
Rivea, 402
Rivina, 388
Roystonea, 385
Ruellia, 405
Ruppia, 382

Sabicea, 120
Sabinea, 392
Saccharum, 382
Salix, 167
Salvia, 404
Samyda, 398
Sansevieria, 386
Sapindus, 167, 396
Sarcomphalus, 396
Sassafras, 161, 169
Savia, 394
Scaevola, 407
Schaefferia, 396
Schinus, 102
Schizophyllus, 410
Schlotheimia, 345
Scleria, 385
Sclerotium, 39, 207
Scolosanthus, 406
Scoparia, 405
Sebesten, 402
Secale, 210, 287
Securidaca, 394
Sematophyllum, 372, 373, 409
Senecio, 133, 134
Serenopsis, 160
Serjania, 396
Sesamum, 405
Sessea, 119
Sesuvium, 389
Sida, 397
Siphocampylos, 121, 122
Smilax, 386
Solanum, 118, 404
Sonchus, 408
Souroubea, 103
Sparattanthelium, 109
Spartina, 384
Spermacoce, 406
Sphagnum, 203, 332
Spiridens, 352
Sporobolus, 383
Stahlia, 391
Stenolobium, 283
Stenostomum, 406
Stenotaphrum, 383
Stereodon, 368
Stereodontopsis, 368, 376
Stereophyllum, 361
Stereum, 410
Stevia, 126, 127
Stigmaphyllon, 394
Strumpfia, 406
Struthiopteris, 187
Strychnos, 205
Suriana, 394
Symphoricarpos, 197, 275
Symphysodontella, 355
Synedrella, 408
Syntherisma, 383
Syrrhopodon, 338–340

Tabebuia, 405
Tabernaemontana, 115
Tagetes, 133
Talinum, 389
Tamarindus, 391
Taonabo, 104
Taxithelium, 370, 409
Tayloria, 345
Tecoma, 405
Tepion, 408
Teramnus, 393
Terminalia, 400
Tetrapteris, 96, 394
Tetrazygia, 400
Thamnium, 359, 360
Thespesia, 398
Thrinax, 385
Thuidium, 363, 364
Tillandsia, 385
Timmiella, 340
Tinctoporia, 138
Tomophagus, 147, 149
Tournefortia, 115, 403
Trachyloma, 352
Trachyphyllum, 361
Trachypodopsis, 357
Trachypus, 357
Tradescantia, 386
Tragia, 395
Trametes, 147, 148
Trematodon, 332
Trianthema, 389
Tricalycites, 168, 169
Trichilia, 394
Trichostigma, 389
Trichostomum, 340
Triphasia, 394
Trismegistia, 369
Triticum, 210, 287
Triumfetta, 397
Trixis, 134
Turnera, 399
Typha, 382
Tyromyces, 148, 153

Uniola, 384
Urechites, 401
Urena, 397

Vachellia, 391
Valerianodes, 403
Valota, 383
Vanilla, 386
Varronia, 403
Verbascum, 207–209, 286, 304
Verbesina, 407
Vernonia, 123–126, 304, 407
Vesicularia, 371
Viburnum, 121, 274
Victoria, 27, 272
Vigna, 393
Viola, 66
Volkameria, 403

Waltheria, 398
Warburgiella, 372
Webera, 351
Wedelia, 408
Weigela, 29, 210, 211
Williamsonia, 156, 157, 169
Wilsoniella, 332
Wissadula, 397
Wittmackia, 385

Xanthium, 407
Xanthochrous, 151
Xanthosoma, 385
Xylophylla, 394

Zamia, 155
Zanthoxylum, 393
Zizyphus, 396

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